

Review of the World Heritage Network: Biogeography, Habitats and Biodiversity



FINAL DRAFT
A Contribution to the Global Strategy for World Heritage Natural Sites

Review of the World Heritage Network: Biogeography, Habitats and Biodiversity

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Foreword

The aim of the World Heritage Convention is to ensure the protection for all time of the world's natural and cultural heritage of Outstanding Universal Value. In 1994, to assist in meeting this aim, the World Heritage Committee adopted a Global Strategy for achieving a balanced, representative and credible World Heritage List that reflects the world's diverse heritage. Over the past 10 years a number of studies and consultations have been carried out to develop and refine the Global Strategy. This review is an important addition to that process, focusing on the inter-related elements of biogeography, habitats and biological diversity that underpin much of what we consider 'natural heritage'.

Two of the four criteria by which Natural World Heritage Sites can be nominated relate respectively to ecological and biological processes, and to the *in-situ* conservation of biological diversity. Understanding the relative values and importance of global biomes, habitats and biological diversity is therefore extremely important in ensuring that new nominations are evaluated on a scientifically sound basis. The availability and application of such knowledge is important in the first place to States Parties as they consider what properties to place on their national Tentative Lists of potential World Heritage nominations and in making the case for inscription in their nominations. It is essential information also for IUCN, as the Advisory Body to the Convention on Natural World Heritage in its evaluation of nominations.

There have been previous reviews of the status of the World Heritage network on the basis of natural values and systems, principally in relation to the use of the Udvardy biogeographic classification system that has been used to map and evaluate sites for a number of years. However, the UNESCO World Heritage Centre and IUCN agreed in 2003 that all parties would benefit from an updated, wider review of Natural World Heritage values using other methods of global biogeographic classification, habitat mapping and approaches to prioritising global conservation values. The UNEP World Conservation Monitoring Centre, which for many years has provided technical support to IUCN and UNESCO on World Heritage matters, was requested to co-operate with IUCN in undertaking the review. The result provides a comprehensive overview of the World Heritage network and a basis for moving forward with finalisation of the Global Strategy as far as natural heritage is concerned.

The Convention has already achieved a great deal since it came into force in 1975. There are currently (2004) 149 Natural and 23 Mixed Sites inscribed on the World Heritage List and they encompass many of the most important landscapes, ecosystems and habitats on the planet (a proportion of these are inscribed for their geological and other earth science values). Although the number of World Heritage Sites is a minute proportion of the total global number of protected areas, they cover almost two million square kilometres - equivalent to more than nine per cent of the total area protected. This large area is dominated by a few very large sites, but it nevertheless highlights the strategic values and significance of the World Heritage Convention at the global scale. Natural World Heritage Sites cover far larger areas, though there are nearly four times as many cultural properties as natural ones. This is because different parameters of scale tend to apply to natural and cultural sites. However, there is now a growing convergence between natural and cultural values, expressed through the increasing number of mixed inscriptions and the use of the Cultural Landscape category of cultural sites – in which IUCN often has a considerable interest.

In an ideal world, the World Heritage List would comprise outstanding examples of all biomes, ecoregions, habitats and high priority conservation areas. This review indicates that we have made

good progress in this regard. However, the World Heritage List can only encompass a small fraction of the most important areas of global natural heritage, since not all areas have sites that can meet the key determinants of Outstanding Universal Value (OUV) and site integrity. Nevertheless, as this report shows, a number of globally important landscapes and habitats are currently not present on the List. The Convention cannot achieve its full potential until all such areas have been thoroughly assessed on the basis of OUV and, where appropriate, inscribed. The recommendations of this review will provide guidance for States Parties and the Advisory Body on the identification of these areas, and thereby help the World Heritage Committee to complete the World Heritage List as far as natural properties are concerned

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Acronyms and Abbreviations

ASEAN	Association of South-East Asian Nations
CI	Conservation International
CIFOR	Center for International Forestry Research
CPD	Centre of Plant Diversity
EBA	Endemic Bird Area
G200	WWF Global 200 Ecoregions
GIS	Geographical Information System
GLCC	Global Land Cover Characterization
ICCROM	International Centre for the Study of the Preservation and Restoration of Cultural Property
ICOMOS	International Council for Monuments and Sites
IUCN	The World Conservation Union
km ²	square kilometres
m	metres
MAB	UNESCO Man and the Biosphere programme
OGs	Operational Guidelines of the WH Convention
OUV	Outstanding Universal Value
SSC	IUCN Species Survival Commission
SPOT	Satellite Pour l'Observation de la Terre [Earth Observation Satellite]
UNEP-WCMC	United Nations Environment Programme World Conservation Monitoring Centre
UNESCO	United Nations Educational, Scientific and Cultural Organisation
WDPA	World Database on Protected Areas
WH	World Heritage
WHC	World Heritage Convention
WHS	World Heritage Site(s)
WWF	World-Wide Fund for Nature

1. Introduction

1.1 The World Heritage Convention

The Convention Concerning the Protection of the World Cultural and Natural Heritage (the 'World Heritage Convention') was adopted by the General Conference of UNESCO in 1972 and entered into force on 17 December 1975. By 28 November 2003, 177 States had signed the Convention, making it one of the most globally adopted international instruments for protecting the world's cultural and natural heritage.

Three international bodies are named as advisory bodies in the Convention:

- for Natural World Heritage: IUCN - The World Conservation Union (IUCN);
- for cultural heritage: the International Council for Monuments and Sites (ICOMOS) and the International Centre for the Study of the Preservation and Restoration of Cultural Property (ICCROM) for Cultural World Heritage.

In addition, Operational Guidelines were prepared for the purpose of informing States Parties to the Convention of the principles which guide the work of the Committee in establishing the World Heritage List and the List of World Heritage in Danger and in granting international assistance under the World Heritage Fund. The guidelines also provide details on monitoring and other issues, mainly of a procedural nature, which relate to the implementation of the Convention. The Operational Guidelines have recently undergone a review and revised guidelines will be adopted at the 28th Session of the World Heritage (WH) Committee in 2004.

1.2 Natural World Heritage

Under the WH Convention, the following are considered as natural heritage:

- natural features consisting of physical and biological formations or groups of such formations, which are of outstanding universal value from the aesthetic or scientific point of view;
- geological and physiographical formations and precisely delineated areas which constitute the habitat of threatened species of animals and plants of outstanding universal value from the point of view of science or conservation;
- natural sites or precisely delineated natural areas of outstanding universal value from the point of view of science, conservation or natural beauty.

1.3 Criteria for Listing of Natural World Heritage Sites

For a site to be included on the World Heritage List, the World Heritage Committee must find that it has 'outstanding universal value' (OUV). The draft revised Convention Operational Guidelines define OUV as:

"...cultural and/or natural significance which is so exceptional as to transcend national boundaries and to be of common importance for present and future generations of all humanity. As such, the permanent protection of this heritage is of the highest importance to the international community as a whole."

"At the time of inscription of a property on the World Heritage List, the Committee will agree on a statement of outstanding universal value." (I.C.4)

It is on the basis of the over-riding principle of OUV that the Committee defines the criteria for inclusion of properties on the WH List. Accordingly, the 2004 draft, revised Operational Guidelines define the following criteria for sites nominated for natural values under section II.C.2:

- (vii) contain superlative natural phenomena or areas of exceptional natural beauty and aesthetic importance (Natural Heritage Criterion [iii] in previous OGs);
- (viii) be outstanding examples representing major stages of earth's history, including the record of life, significant on-going geological processes in the development of landforms, or significant geomorphic or physiographic features (Natural Heritage Criterion [i] in previous OGs);
- (ix) be outstanding examples representing significant ongoing ecological and biological processes in the evolution and development of terrestrial, fresh water, coastal and marine ecosystems and communities of plants and animals (Natural Heritage Criterion [ii] in previous OGs);
- (x) contain the most important and significant natural habitats for in-situ conservation of biological diversity, including those containing threatened species of Outstanding Universal Value from the point of view of science or conservation (Natural Heritage Criterion [iv] in previous OGs).

In addition to fulfilling one or more of these criteria, the protection, management and integrity of a site are also important considerations that are taken into account by the Committee. Mixed sites are those that have both outstanding natural and cultural values. Since 1992, significant interactions between people and the natural environment have also been recognised as cultural landscapes. In January 2004, the World Heritage List consisted of a total of 754 properties in 125 States Parties. Of these, 582 were inscribed as cultural properties, 149 as natural sites and 23 as mixed properties. The increasing convergence between natural and cultural World Heritage values is reflected in the merging of cultural and natural criteria into a single list ranging from Criteria (i) to (x).

1.4 The Global Strategy

In 1994 the WH Committee adopted a Global Strategy for achieving a balanced WH List, with the aim of ensuring that the List reflected the world's diverse cultural and natural heritage of outstanding universal value. Various conferences and workshops to develop and refine the overall strategy have since been held in Africa, the Pacific, the Middle East and Arabia, the Andes, the Caribbean, Central Asia and Southeast Asia. In addition, since 1996 IUCN, in collaboration with the UNESCO WH Centre, the United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) and the Ramsar Secretariat, have produced a series of thematic studies, providing overview assessments of major themes relating to natural sites. These have included working papers on the Earth's geological history (Wells 1996), wetland and marine areas (Thorsell *et al.* 1997), biodiversity (Gillet *et al.* 1998), tropical forests (CIFOR *et al.* 1999), karst sites in the Asia-Pacific (Wong *et al.* 2001) and tropical marine, coastal and small island ecosystems (Green *et al.* 2001). Further such studies are planned to ensure that all thematic and specific geographic areas are reviewed. For example, a review of Natural World Heritage potential in Central Asia will be completed in 2004.

Thorsell (2002) conducted a preliminary review of coverage of the world's major ecosystems/habitats natural and mixed sites included in the WH List and Tentative Lists¹. His analysis utilised the Udvardy classification system of global biogeographical provinces (Udvardy 1975) which was prepared for UNESCO's Man and the Biosphere Programme and published by IUCN with an update in 1982. This hierarchical system divides the world's terrestrial habitats into eight approximately continent-sized biogeographic realms, subdivided into 193 biogeographic provinces. Udvardy also used a system of 14 biomes (broad ecosystem types). Since their development, Udvardy biomes and provinces have been used by UNEP-WCMC and IUCN for preparing the World Heritage Site Sheets held at UNEP-WCMC. These are initially used as part of the evaluation of nominated sites, and maintained subsequently for those sites that are inscribed on the WH List. Thorsell's analysis showed that biomes and biogeographic provinces in polar regions, lake systems, tundra and boreal forest were not as prevalent on the WH List as humid, subtropical and mixed mountain systems. His report also noted that the Udvardy system of realm and biome classification had a number of limitations (for example, marine and coral reef sites are not fully represented in this system) and did not adequately reflect the full range of habitats occurring in WH sites. He concluded that other classification systems were needed to refine and complement the Udvardy approach.

1.5 Purpose, Scope and Approach of the Current Review

In 2003, on the basis of the findings of the earlier review, the UNESCO WH Centre and IUCN requested UNEP-WCMC to undertake a new review to provide a combined assessment of global habitat, biogeographic systems and biodiversity values within the World Heritage network, and to provide recommendations arising from the findings.

Using Geographic Information System (GIS) analyses and literature review, this study examines the current List of Natural and Mixed WH Sites from the perspective of natural values related to biogeography, habitats and biodiversity. The review addresses Criteria (ix) and (x) under the draft revised OGs ([ii] and [iv] under the current OGs) - Criteria (vii) and (viii) are not addressed. Specifically, the review objectives are to:

- provide a comprehensive assessment of the coverage of all the major global habitat types within the World Heritage network through analyses of global habitat mapping and biodiversity prioritisation schemes ;
- develop comprehensive maps combining World Heritage Sites with major habitats and other natural features; and
- report on the findings, including the identification of significant gaps in the World Heritage network where nominations can be encouraged provided that they are of OUV and meet conditions of integrity.

There have been a small number of such studies in the past, but these have been constrained by lack of accurate geospatial information on the distribution of ecosystems, and have tended to focus on single habitats, or utilised summary information such as biodiversity hot-spots. This review provides a comparative overview of the World Heritage network using the following prioritisation and classification schemes :

¹ "The Global Strategy is supported by a continuous process of identification of the heritage by States Parties. The elements of that heritage which States Parties consider to be of outstanding universal value and therefore suitable for nomination for inclusion in the World Heritage List are identified in the Tentative List, an inventory of those properties which each State Party intends to consider for nomination during the following years." (Draft 2004 Revised Operational Guidelines II.B.1)

Biogeography

- Udvardy biogeographic system**

Given its long period of use in relation to WH evaluations, and its continuing value despite some limitations, it was considered important to include an up-to-date analysis using the Udvardy system in this review for comparative purposes.

- World Wide Fund for Nature (WWF) Global 200 Ecoregions**

WWF's Global 200 ecoregions are subsets derived from outstanding examples of 14 defined terrestrial, freshwater, and marine major habitat types and seven biogeographic realms. They are also comprised of varying combinations of the 867 ecoregions identified overall by WWF. In terms of World Heritage analysis the system offers a potential alternative or complementary approach to the Udvardy system since it is not only biogeographically based but also prioritised on the basis of conservation values.

Habitats

- IUCN/Species Survival Commission (SSC) Global Habitat Classification**

This scheme is under development, mainly to provide a standard tool for characterising habitat preferences and habitat occupancy of species on the IUCN Red List. There is a close inter-linkage between this system and the Global Land Cover Characterization.

- Global Land Cover Characterization (GLCC)**

This classification system was developed by Olson (1994a, 1994b) for the purpose of formulating a global ecosystem framework, which uses 94 ecosystem classes.

Biodiversity

- Conservation International (CI) Biodiversity Hotspots**

Conservation International has identified 25 biodiversity hotspots around the world, based principally on a combination of high plant endemism and significant human impact. In order to qualify as a hotspot a region must contain 1,500 endemic plant species – 0.5% of the global total. However, hotspots also hold an enormous number of the planet's endemic fauna.

- BirdLife International Endemic Bird Areas (EBAs)**

BirdLife International has designated approximately 2% of the world's land surface as Endemic Bird Areas or EBAs. Globally 218 different EBAs have been identified, covering the ranges of 93% of restricted range birds (2,451 species or roughly 25% of all known bird species).

- IUCN/WWF Centres of Plant Diversity**

This scheme identifies 250 major sites of botanical diversity around the globe. The principle criteria are high species diversity or large numbers of endemic species, or both. Other factors related to CPDs include: importance as gene pools for plants with value to humans; sites with a diverse range of habitat types; and (similar to CI hotspots) those that are threatened or under imminent threat.

Except for the Udvardy and the GLCC systems all of these priority identification and classification systems have in common an origin or focus on high conservation values and threats. Together they provide a biogeographic mapping framework based on 'first principles' (Udvardy) as well as high conservation value (WWF Global 200 Ecoregions), habitat mapping at different resolutions of the 'real world' based on remote sensing analysis, and thematically derived priority conservation systems (hotspots, EBAs and CPDs). Theoretically, all of these approaches provide both an evaluation framework and prioritisation for the existing WH network and potential additions to that network. It is anticipated that the review analyses and findings will further strengthen the role of the

Convention as a key instrument in the process of conserving the world's biodiversity. The findings of the review will also provide support to States Parties to the World Heritage Convention in prioritising areas for designation on their Tentative Lists.

1.6 Global Overview of the Current World Heritage Network

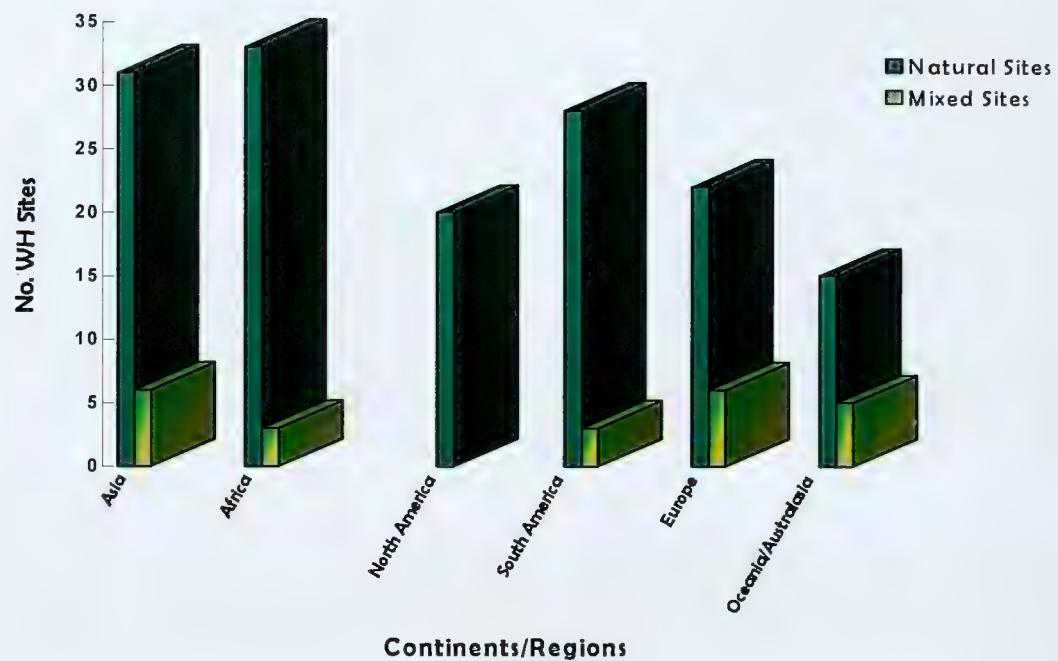
Brief summary descriptions of the 149 current Natural and Mixed World Heritage Sites are provided in Annex 1 and 2 respectively. The breakdown of natural and mixed properties by continent or region is shown in Table 1 and Figure 1. For the purposes of this review, Europe was defined as limited in the east by the Bosphorus/Dardanelles, Caucasus and the Urals. Thus the two WH Sites in Turkey were considered to be in Asia, and the Virgin Komi Forests and Western Caucasus in the Russian Federation were classed as European sites. North America was taken to include only the countries of Canada, the USA (including Hawaii) and Mexico, while Central America and the Caribbean were included in South America. Australia, New Zealand and the Pacific Islands were collectively grouped as Oceania/Australasia. There are no WH Sites in Antarctica, as it is excluded from the Convention.

As might be expected, the general trend is that the larger the continent the more WH sites it possesses, but North America is the exception to this rule. North America also has no Mixed WH Sites. Oceania/Australasia has the highest density of WH sites (approximately 1 WH Site per 440,000 km² of continental area), but this figure is biased by the large area of sites in Australia. North America has the lowest density of sites (1 per 1,235,000 km²).

Table 1: World Heritage Site Occurrence by Continent/Region

Continent/Region	No. of WH Sites		
	Natural	Mixed	Total
Asia	31	6	37
Africa	33	3	36
North America	20	0	20
South America	28	3	31
Europe	22	6	28
Oceania/Australasia	15	5	20
Total	149	23	172

Figure 1: Continental/Regional Distribution of Natural and Mixed Properties on the World Heritage List



2. BIOGEOGRAPHIC ANALYSES

2.1 Udvardy Biogeographical Provinces

Udvardy (1975) introduced a unifying system of biogeographic delimitations that has been widely used by biologists for almost 30 years. His scheme divides the world into eight large Biogeographical Realms, which are continent or sub-continent sized areas with unifying features of geography and fauna/flora/vegetation. These are subdivided into 14 biomes and 193 Biogeographical Provinces, which approximately correspond to floristic regions of botanists and the faunal provinces of zoologists.

The numbers and areas of Natural and Mixed WH Sites in each Biogeographical Realm are shown in Table 2. The Palearctic Realm has the most WH sites (53) and the largest area in WH sites but a relatively low percentage area coverage (0.72%) since it is by far the largest realm. The Neotropical realm has almost double the number of WH Sites (32) as the Nearctic (18) but percentage coverage is only one third greater (1.28% versus 0.92%). The Indomalayan realm is the most poorly covered. Its 15 WH sites only cover approximately 0.16% of the realm.

Table 2: World Heritage Sites and Udvardy Realms

Udvardy Realm	No. of WH Sites	Area of Realm	Total area in WH Sites	% Realm in WH Sites
Africotropical	31	22,156,119.20	285,293.86	1.29
Antarctic	5	285,355.56	24,635.04	8.63
Australian	13	7,704,908.69	69,786.06	0.91
Indomalayan	15	7,533,957.86	12,049.90	0.16
Nearctic	18	22,895,770.40	210,068.41	0.92
Neotropical	32	18,975,799.20	243,291.11	1.28
Oceanian	5	1,035,287.16	16,934.21	1.64
Palaearctic	53	54,136,995.76	387,510.17	0.72
Total	172	134,724,193.83	1,249,568.77	0.93

Note: There are 463,549.57 km² of WH Sites that are marine and coastal and have no assigned Udvardy realm. These include 338,661 km² of sea in the Great Barrier Reef and 49,595 km² of sea in the Galapagos Islands. Two of the four biogeographic provinces in the Antarctic Realm, namely Maudlandia and Marielandia, are missing from the GIS dataset, while two, Neozelandia and Insulantarctica, are present. Hence the percentage coverage of the Antarctic Realm is unrealistically high. Several smaller islands e.g. Aldabra, Cocos Island also have no assigned Udvardy Province code.

All of Udvardy's Biomes contain WH Sites (Table 3 and Maps 1-6), except Cold Winter Deserts. Mountain systems (32), tropical humid (26), and tropical dry forests (25) are the three most common biome classifications found in existing WH sites. Tundra and polar systems (4) and temperate grasslands (4) are the least common biome classifications occurring in existing Natural and Mixed WH Sites.

Table 3: World Heritage Sites and Udvardy Biomes

Biome	No. of WH Sites
Mixed Mt. Systems	32
Humid Tropical Forests	26
Tropical Dry/Deciduous Forests	25
Mixed Island Systems	22
Subtropical/temperate Rainforest	14
Warm Desert/semi-deserts	13
Temperate Broad-leaf Forests	12
Temperate Needle-leaf Forests	10
Evergreen sclerophyll Forest/Scrub	9
Tropical Grassland/Savannas	8
Lake systems	5
Tundra/polar desert	4
Temperate Grasslands	4
Cold Winter Deserts	0

Note: Some sites incorporate more than one biome, so the total number of sites is inflated.

Just over half (108 or 56%) of the 193 Udvardy Biogeographical Provinces are represented in WH Sites (Table 4). The geographical extent of representation ranges from 107,939 km² in the case of the Saharan Province, to 0.19 km² in the case of the Seychelles and Amirantes Islands Province. The percentage extent of representation ranges from 100% (Lake Baikal) to as little as 0.000021% in the case of the Vallée de Mai. A further three Provinces have more than 10% of their area in WH Sites: South Trinidade Island (WH Site Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves); Tasmanian (Tasmanian Wilderness WH Site) and Campos Limpos (Canaima National Park WH Site). Certain island Provinces in which WH Sites occur were not defined in the Udvardy GIS data set used, for example Cocos Island, Fernando de Noronja and the Comores Islands and Aldabra Provinces. Therefore no percentage representation could be calculated. The 85 Provinces without WH Sites are listed in Table 5.

Table 4: World Heritage Site Occurrence in Uduardy Biogeographical Realms and Provinces

Realm	Province	World Heritage Site	Country	Area in WH Site (km ²)	Province Area (km ²)	% Province in WH Site
Africotropical	Central African Highlands	Kahuzi-Biega National Park Okapi Wildlife Reserve	DR Congo	4,478.57 6,497.99		
	Total			10,976.56	269,452.56	4.07
	Congo Rain Forest	Dia Faunal Reserve Okapi Wildlife Reserve Salonga National Park	Cameroon DR Congo	6,263.93 7,439.24 34,655.38		
	Total			48,358.56	1,921,888.09	2.52
	Comores Islands and Aldabra Atoll	Aldabra Atoll	Seychelles	160.15	?	?
	Total			?	?	?
	East African Highlands	Mt Kenya National Park/Natural Forest	Kenya	1,441.41		
	Total			1,441.41	65,449.76	2.20
	Bwindi Impenetrable National Park	Rwenzori Mountains National Park Garamba National Park	Uganda	322.17		
	East African Woodland/Savanna	Kahuzi-Biega National Park Virunga National Park	DR Congo	4,998.67 1,162.95 7,645.88 651.44		
East Asian	Manovo-Gounda St. Floris National Park	Central African Republic		3,907.12		
	Serengeti National Park	UR Tanzania		7,857.98		
	Total			26,546.22	1,510,558.82	1.76
	Ethiopian Highlands	Simien National Park	Ethiopia	111.01		
	Total			111.01	505,370.85	0.02
Indo-Pacific	Guinean Rain Forest	Mount Nimba Strict Nature Reserve Tai National Park	Côte d'Ivoire/ Guinea	150.66 4,382.27		
	Total			4,532.93	607,029.09	0.75
	Lake Malawi (Nyasa)	Lake Malawi National Park	Malawi	33.06	28,948.15	0.11
	Total			33.06		
Neotropical	Lake Rudolf	Lake Turkana National Parks	Kenya	124.16		
	Total			124.16	7,332.23	1.69
	Malagasy Woodland/Savanna	Tsingy de Bemaraha Strict Nature Reserve	Madagascar	1,476.94		
Total				1,476.94	324,057.58	0.46

	Miombo Woodland/Savanna	Lake Malawi National Park	Malawi	43.72		
	Mana Pools National Park, Sapi and Chewore Safari Areas	Zimbabwe		6,780.92		
	Mosi-oa-Tunya/Victoria Falls	Zambia/Zimbabwe		65.76		
	Selous Game Reserve	UR Tanzania		30,363.15		
	<i>Total</i>		37,253.55	2,431,998.93		1.53
	Somalian Woodland/Savanna	Lake Turkana National Parks	Kenya	671.39		
		Kilimanjaro National Park		1,388.74		
		Ngorongoro Conservation Area	UR Tanzania	8,317.65		
		Selous Game Reserve		17,501.07		
		Serengeti National Park		9,400.17		
		Simien National Park	Ethiopia	23.49		
		<i>Total</i>		37,302.51	2,166,723.75	1.72
	South African Woodland/Savanna	Greater St Lucia Wetland Park	South Africa	1,985.95		
		Ukahlamba / Drakensberg Park		2,282.37		
		<i>Total</i>		4,268.32	1,694,798.35	0.25
	West African Woodland/Savanna	Cliffs of Bandiagara (Land of the Dogons)	Mali	3,129.26		
		Comoé National Park	Côte d'Ivoire	11,720.09		
		Manovo-Gounda St. Floris National Park	Central African Republic	140.03		
		Djoudj National Bird Sanctuary		11,533.27		
		Niokolo-Koba National Park	Senegal	8,455.91		
		'W' National Park	Niger	2,242.86		
		<i>Total</i>		37,221.41	3,247,531.64	1.15
	Western Sahel	Air and Ténéré Natural Reserves	Niger	69,742.18		
		Banc d'Arguin National Park	Mauritania	5,905.04		
		<i>Total</i>		75,647.22	2,814,581.35	2.69
					285,293.86	22,156,119.20
						1.29
	Antarctic	Insulantartica	Heard and McDonald Islands	Australia	386.00	
			Gough Island Wildlife Reserve	UK	64.10	
		<i>Total</i>		450.10	19,270.88	2.34
	Neozealandia	Macquarie Island	Australia	107.58		
		New Zealand Sub-Antarctic Islands			669.17	
		Te Wahipounamu - South West NZ	New Zealand	23,110.43		
		Tongariro National Park		683.76		
		<i>Total</i>		24,570.94	266,148.77	9.23
					25,021.04	285,355.56
						8.77
	Central Desert	Uluru-Kata Tjuta National Park	Australia	1,254.50		

Australian	Central Desert Savannas	Uluṟu-Kata Tjuṯa National Park Willandra Lakes Region	Australia	1,254.50 2,630.12	1,767,021.70 558,257.12	0.07 0.47
	Eastern Sclerophyll Total	Central Eastern Rainforest Reserves (Australia) The Greater Blue Mountains Area	Australia	2,214.85 10,347.50		
	Northern Coastal Total	Kakadu National Park	Australia	8,039.39 12,562.35	632,675.70	1.99
	Northern Grasslands Total	Australian Fossil Mammal Sites - Riversleigh	Australia	8,039.39 91.04	349,949.45 962,825.04	2.30 0.01
	Northern Savanna Total	Australian Fossil Mammal Sites - Riversleigh Kakadu National Park Purnululu National Park	Australia	19.02 10,750.93 2,400.75		
	Queensland Coastal Total	Central Eastern Rainforest Reserves (Australia) Fraser Island Great Barrier Reef Wet Tropics of Queensland	Australia	272.42 2,266.49 1,502.43 6,911.80		
	Southern Sclerophyll Total	Australian Fossil Mammal Sites - Naracoorte	Australia	1.71 1.71	313,550.62 232,958.87	3.49 0.00
	Tasmanian Total	Tasmanian Wilderness	Australia	14,632.27 14,632.27	67,971.48	21.53
	Western Mulga Total	Shark Bay, Western Australia	Australia	2,570.52 2,570.52	780,894.39	0.33
	Western Sclerophyll Total	Shark Bay, Western Australia	Australia	3,880.33 3,880.33	396,661.95	0.98
Australian Total				69,786.06	7,704,908.69	0.91
Indomalayan						
Borneo	Bengalian Rainforest	Sundarbans National Park The Sundarbans	India Bangladesh	909.57 950.84		
Total	Kinabalu Park	Gunung Mulu National Park		1,860.42 756.73	179,943.61	1.03
				535.34		

	<i>Total</i>					
Burma Monsoon Forest	Kaziranga National Park	India		1,292.07	740,855.60	0.17
	Manas Wildlife Sanctuary			317.27		
	<i>Total</i>			532.53		
Ceylonese Rainforest	Sinhalaia Forest Reserve	Sri Lanka		849.79	297,208.98	0.29
	<i>Total</i>			95.81		
Indochinese Rainforest	Phong Nha-Ke Bang National Park	Vietnam		95.81	31,102.97	0.31
	Thungyai - Huai Kha Khaeng Wildlife Sanctuaries	Thailand		5,915.54		
	<i>Total</i>			6,811.48	452,491.49	1.51
Indus-Ganges Monsoon Forest	Keoladeo National Park	India		28.58		
	<i>Total</i>			28.58	1,412,207.78	0.00
Java	Ujung Kulon National Park	Indonesia		533.51		
	<i>Total</i>			533.51	137,249.33	0.39
Lesser Sunda Islands	Komodo National Park	Indonesia		523.47		
	<i>Total</i>			523.47	86,032.22	0.61
Philippines	Puerto-Princesa Subterranean River National Park	Philippines		54.27		
	<i>Total</i>			54.27	292,147.88	0.02
Seychelles and Amirantes Islands	Vallée de Mai Nature Reserve	Seychelles		0.19		
	<i>Total</i>			0.19	204.31	0.09
South Chinese Rainforest	Ha Long Bay	Vietnam		0.31		
	<i>Total</i>			0.31	186,687.62	0.00
Indomalayan Total				12,049.90	7,533,957.86	0.16
	Nearctic					
Austroriparian	Everglades National Park	USA		267.88		
	<i>Total</i>			267.88	596,877.54	0.04
Californian	Yosemite National Park	USA		82.90		
	<i>Total</i>			82.90	200,879.46	0.04
Canadian Taiga	Gros Morne National Park	Canada		1,832.24		
	Miguasha Park			0.54		
	Nahanni National Park			4,782.34		
	Wood Buffalo National Park			44,029.01		
	<i>Total</i>			50,644.13	5,127,125.42	0.99
Chihuahuan	Carlsbad Caverns National Park	USA		185.77		
	<i>Total</i>			185.77	577,170.94	0.03
Eastern Forest	Great Smoky Mountains National Park	USA		1,974.83		

	Mammoth Cave National Park		222.95		
	Total		2,197.78	2,222,944.30	0.10
Grasslands	Dinosaur Provincial Park	Canada	38.44		
	Total		38.44	2,442,278.81	0.00
Oregonian	Olympic National Park	USA	3,499.25		
	Redwood National Park		397.82		
	Total		3,897.07	124,601.58	3.13
Rocky Mountains	Canadian Rocky Mountain Parks	Canada	20,406.70		
	Waterton Glacier International Peace Park	Canada/USA	3,052.85		
	Grand Canyon National Park	USA	4,949.31		
	Yellowstone		8,816.45		
	Total		37,225.32	1,578,461.82	2.36
Sierra-Cascade	Yosemite National Park	USA	2,970.36		
	Total		2,970.36	228,709.46	1.30
Sitkan	Kluane/Wrangell-St Elias/Glacier Bay/Tatshenshini-Alsek	Canada/USA	53,741.22		
	Total		53,741.22	350,557.69	15.33
Sonoran	Grand Canyon National Park	USA	4,760.52		
	Whale Sanctuary of El Vizcaino	Mexico	3,252.41		
	Total		8,012.94	507,753.12	1.58
	Kluane/Wrangell-St Elias/Glacier Bay/Tatshenshini-Alsek	Canada/USA	50,293.89		
Yukon Taiga	Nahanni National Park	Canada	510.70		
	Total		50,804.59	1,019,544.78	4.98
	Nearctic Total		210,068.41	22,895,770.40	0.92
Neotropical					
Amazonian	Central Amazon Conservation Complex	Brazil	64,424.22		
	Total		64,424.22	2,509,309.71	2.57
Brazilian Planalto	Iguacu National Park	Brazil	25.00		
	Total		25.00	219,156.95	0.01
Brazilian Rain Forest	Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks	Brazil	3,140.90		
	Discovery Coast Atlantic Forest Reserves		7,111.04		
	Iguacu National Park		1,365.59		
	Iguazu National Park	Argentina	593.84		
	Total		12,211.37	1,533,799.57	0.80
Caribbean	Belize Barrier-Reef Reserve system	Belize	33.97		
	Stan Ka'an	Mexico	3,633.52		

	Tikal National Park	Guatemala	8,876.87	
	Total		12,544.35	259,150.30
Campos Cerrados	Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks	Brazil	2,347.00	4.84
	Pantanal Conservation Complex		10,961.72	
	Noel Kempff Mercado National Park	Bolivia	2,024.75	
	Total		15,333.47	1,778,617.67
Campos Limpos	Caraima National Park	Venezuela	23,848.32	0.86
	Total		23,848.32	207,262.46
Central American	Area de Conservación Guanacaste	Costa Rica	820.39	11.51
	Rio Plátano Biosphere Reserve	Honduras	3,990.42	
	Talamanca Range-La Amistad Reserves / La Amistad National Park	Costa Rica/Panama	1,968.13	
	Total		6,778.95	309,962.42
Chilean Nothofagus	Los Glaciares	Argentina	6,823.88	2.19
	Total		6,823.88	123,708.67
Colombian Coastal	Darién National Park	Panama	284.67	5.52
	Los Katíos National Park	Colombia	584.56	
	Total		869.23	237,189.11
Cocos Island	Cocos Island National Park	Costa Rica	?	0.37
	Total		?	?
Cuban	Alejandro de Humboldt National Park	Cuba	692.44	
	Desembarco del Granma National Park		271.11	
	Total		963.55	109,749.29
Everglades	Everglades National Park	USA	3,294.34	0.88
	Total		3,294.34	6,826.49
Fernando de Noronja Island	Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves	Brazil	?	48.26
	Total		?	?
Galápagos Islands	Galápagos Islands	Ecuador	7,603.12	
	Total		7,603.12	7,603.21
Guyanan	Caraima National Park	Venezuela	6,607.36	100.00
	Central Suriname Nature Reserve	Suriname	16,256.73	
	Total		22,864.09	1,009,068.11
Lesser Antillean	Morne Trois Pitons National Park	Dominica	67.22	2.27
	Total		67.22	6,603.57
Monte	Ischnigualasto - Talampaya Natural Parks	Argentina	2,463.10	1.02
	Península Valdés		3,699.35	
	Total		6,162.45	1,234,788.71
Northern Andean	Sangay National Park	Ecuador	5,697.62	0.50

Pacific Desert	Huascaran National Park	Peru	5,697.62	256,496.59
Total			185.10	0.06
Panamanian	Darién National Park	Panama	185.10	290,381.66
	Los Katíos National Park	Colombia	5,245.16	
Total			3.81	
Puna	Historic Sanctuary of Machu Picchu	Peru	5,248.97	40,064.24
	Manu National Park		372.28	
Total			2,980.39	
	Atlantic Forest Southeast Reserves	Brazil	3,352.67	464,855.70
Serro Do Mar	Discovery Coast Atlantic Forest Reserves		14,944.42	0.72
Total			11,873.66	
South Trinidade Island	Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves	Brazil	26,818.07	243,783.64
Total			10.57	11.00
Southern Andean	Huascaran National Park	Peru	3,103.31	10.57
	Rio Abiseo National Park		349.39	
	Los Glaciares	Argentina	2,846.50	
Total			6,299.21	662,923.36
Yucatecan	Sian Ka'an	Mexico	0.83	0.95
Total			0.83	39,955.85
Yungas	Manu National Park	Peru	11,864.53	0.00
Total			11,864.53	483,127.25
Neotropical Total			243,291.11	18,975,799.20
				1.28
Hawaiian	Hawaii Volcanoes National Park	USA	706.77	
Total			706.77	16,713.44
New Caledonian	Lord Howe Island Group	Australia	15.06	4.23
Total			15.06	
Papuan	East Rennell	Solomon Islands	306.25	
	Lorentz National Park	Indonesia	15,885.27	0.08
Total			16,191.52	19,089.88
Southeastern Polynesian	Henderson Island	UK	20.87	
Total			20.87	959,330.27
Oceanian Total				1.69
Palaearctic				
Altai Highlands	Golden Mountains of Altai	Russian Federation	17,028.51	
Uvs Nuur Basin		Russian Federation /Mongolia	12,576.76	

Total	Göreme National Park and the Rock Sites of Cappadocia	Turkey		29,605.27	1,048,248.77	2.82
Anatolian-Iranian Desert Total				162.84		
Arabian Desert Total	Arabian Oryx Sanctuary	Saudi Arabia	26,833.40	2,203,707.02	0.01	
Atlantic Total	Pyrénées - Mont Perdu	France/Spain	26,833.40	2,995,987.67	0.90	
Balkan Highlands	Durmitor National Park Ohrid Region with its Cultural and Historical Aspect and its Natural Environment	Serbia&Montenegro FYR Macedonia	79.94 1,245.73	715,931.75	0.01	
Boreonemoral Total	Belovezhskaya Puscha Bialowieza Forest	Belarus Poland	1,494.70 1,307.32	221,236.01	0.68	
British Islands Total	Dorset and East Devon Coast Giants Causeway and Causeway Coast	UK	43.62 1,350.93	1,285,274.33	0.11	
Caucaso-Iranian Highlands Total	Western Caucasus	Russian Federation	16.87 1.01	17.88	266,599.82	0.01
Central European Highlands Total	Jungfrau-Aletsch-Bietschhorn Monte San Giorgio Messel Pit Fossil Site	Switzerland Germany	579.89 537.68	935,994.01	0.06	
Chinese Subtropical Forest Total	Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area	China	3.47 23.91	565.06	369,891.81	0.15
East Siberian Taiga Total	Central Sikhote-Alin Lake Baikal	Russian Federation	379.56 7,440.50	379.56	862,959.56	0.04
Himalayan Highlands Total	Manas Wildlife Sanctuary Nanda Devi National Park Royal Chitwan National Park Sagarmatha National Park	India Nepal	50,002.21 57,442.71	5,536,100.10	1.04	
Iberian Highlands Total	Pyrénées - Mont Perdu	France/Spain	28.94 815.34 1,145.09 1,125.77	3,115.14	860,048.76	0.36

	Japanese Evergreen Forest	Yakushima	Japan	436.94		
	Total			436.94	266,876.45	0.16
Kamchatkan Volcanoes	Kamchatkan Total	Kamchatka	Russian Federation	33,942.75		
Lake Baikal	Lake Baikal Total	Baikal	Russian Federation	33,942.75	283,310.74	11.98
Macaronesian Islands	Garaionay National Park Laurisilva of Madeira Total		Spain Portugal	32,260.41	32,260.41	100.00
Manchu-Japanese Mixed Forest	Central Sikhote-Alin Total		Russian Federation	65.11		
	Cape Girolata, Cape Porto, Scandola Nature Reserve and the Piana Calanches in Corsica		France	127.85		
Mediterranean Sclerophyll	Doñana National Park Ibiza, biodiversity and culture Hierapolis-Pamukkale Ichkeul National Park Meteora Mount Athos Pirin National Park Plitvice Lakes National Park Skocjan Caves Western Caucasus Total		Spain Turkey Tunisia Greece Bulgaria Croatia Slovenia Russian Federation	192.96	14,031.23	1.38
	Caves of Aggtelek Karst and Slovak Karst Messel Pit Fossil Site Srebarna Nature Reserve Total		Hungary/Slovakia Germany Bulgaria China	8,051.02	1,252,244.78	0.64
Oriental Deciduous Forest	Huanglong Scenic and Historic Interest Area Jiuzaigou Valley Scenic and Historic Interest Area Mount Huangshan Mount Taishan Mount Wuyi			595.54		
				0.01		
				11.26		
				606.81	1,467,287.64	0.04
				151.30		
				611.82		
				205.10		
				268.44		
				1,147.69		

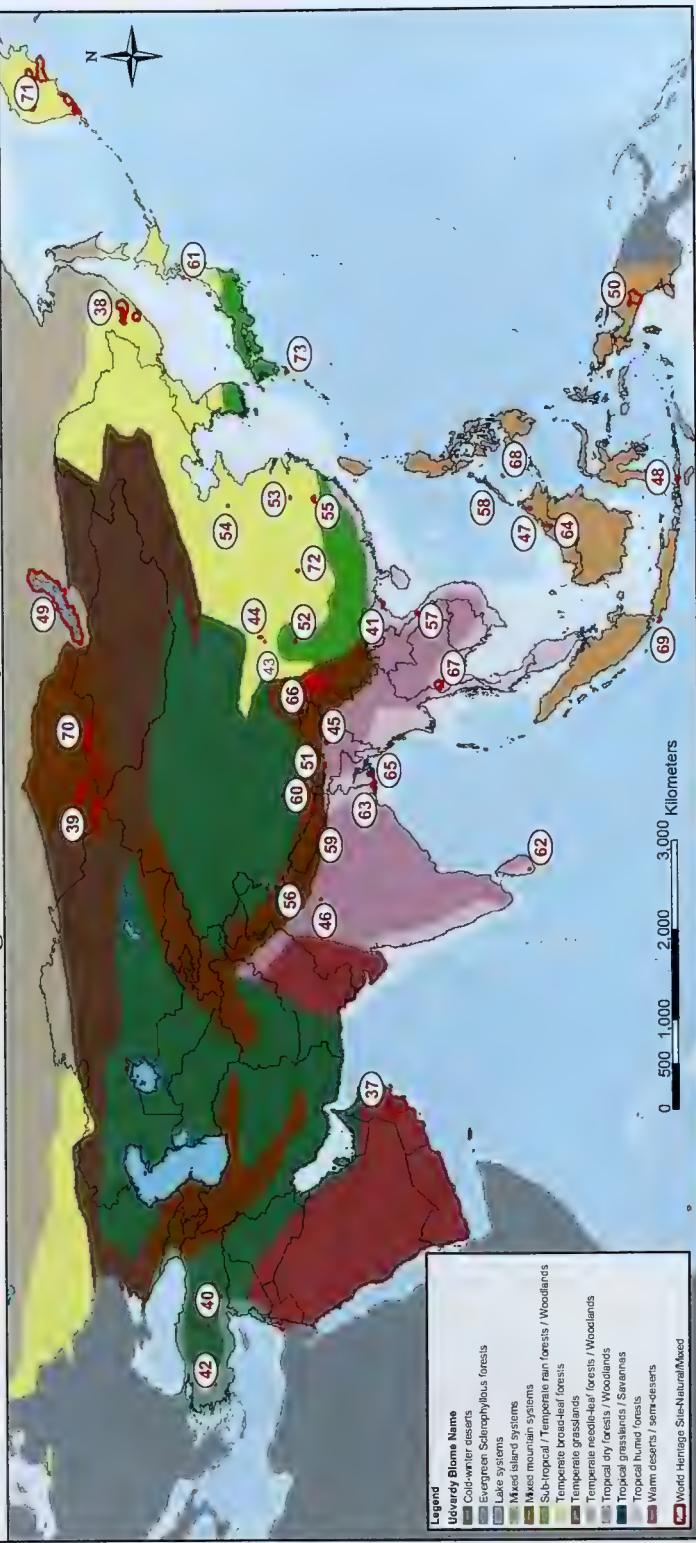
Wulingyuan Scenic and Historic Interest Area			130.97	
Shirakami-Sanchi	Japan		394.57	
<i>Total</i>		2,909.88	2,751,381.59	0.11
Pontian Steppe	Danube Delta	Romania	6,883.44	
<i>Total</i>		6,883.44	1,945,335.55	0.35
Sahara	Air and Ténéré Natural Reserves	Niger	8,825.11	
	Tassili n'Ajjer	Algeria	99,114.65	
<i>Total</i>		107,939.76	6,960,671.82	1.55
Scottish Highlands	St. Kilda	UK	11.08	
<i>Total</i>			11.08	46,801.67
Subarctic Birchwoods	Laponian Area	Sweden	524.22	
<i>Total</i>		524.22	132,506.91	0.40
Szechwan Highlands	Three Parallel Rivers of Yunnan Protected Areas	China	21,297.89	
<i>Total</i>		21,297.69	578,553.07	3.68
West Eurasian Taiga	Laponian Area	Sweden	8,848.49	
	The High Coast		773.02	
	Virgin Komi Forests	Russian Federation	36,425.59	
<i>Total</i>		46,047.10	5,342,645.54	0.86
Palearctic Total			387,510.17	54,136,995.76
Unassigned Total			463,549.57	0.72
	Grand Total		1,713,118.35	

Table 5: Udvardy Biogeographical Provinces without World Heritage Sites

Biogeographical Realm	Biogeographical Province	Province Area (km ²)
Africotropical	Ascension and St Helena Islands	186.96
	Cape Sclerophyll	129,680.54
	Congo Woodland/Savanna	1,356,712.80
	Eastern Sahel	1,169,668.01
	Guinean Highlands	80,027.59
	Kalahari	504,858.41
	Karoo	377,724.97
	Lake Tanganyika	32,751.86
	Lake Ukerewe (Victoria)	69,495.81
	Malagasy Rain Forest	200,567.83
	Malagasy Thorn Forest	70,679.42
	Mascarene Islands	4,493.37
	Namib	364,591.91
	South African Highlands	198,958.55
Antarctic	Maudlandia	?
	Marielandia	?
Australian	Brigalow	228,285.80
	Southern Mulga/Saltbush	829,206.69
Indomalayan	Andaman and Nicobar Islands	6,224.77
	Burman Rainforest	257,568.75
	Ceylonese Monsoon Forest	34,911.01
	Cocos-Keeling and Christmas Islands	?
	Coromandel	88,397.98
	Deccan Thorn Forest	338,402.53
	Laccadives Islands	?
	Mahanadian	219,425.10
	Malabar Rainforest	223,545.95
	Malayan Rainforest	179,162.04
	Maldives and Chagos Islands	36.24
	Sulawesi (Celebes)	196,481.45
	Sumatra	465,601.75
	Taiwan	36,559.49
	Thailandian Monsoon Forest	959,704.25
	Thar Desert	711,804.94
Nearctic	Alaskan Tundra	863,686.81
	Aleutian Islands	124,428.48
	Arctic Archipelago	690,056.42
	Arctic Desert and Icecap	2,120,304.54
	Canadian Tundra	1,733,301.17
	Great Basin	660,344.88
	Great Lakes	254,492.46
	Greenland Tundra	498,650.91
	Madrean-Cordilleran	763,227.25
	Tamaulipan	210,372.56
Neotropical	Argentinian Pampas	512,140.22
	Babacu	293,019.12
	Bahamas-Bermudean	12,822.07

	Caatinga	899,710.69
	Chilean Araucaria Forest	32,866.62
	Chilean Sclerophyll	57,329.43
	Colombian Montane	154,770.94
	Equadorian Dry Forest	50,341.25
	Gran Chaco	988,487.38
	Greater Antillean	95,747.28
	Guerrera	158,431.28
	Lake Titicaca	7,244.38
	Llanos	437,974.94
	Madeiran	1,671,747.48
	Patagonian	413,105.83
	Revilla Gigedo Island	196.16
	Sinaloan	192,115.01
	Uruguayan Pampas	522,186.88
	Valdivian Forest	111,929.87
	Venezuelan Deciduous Forest	58,926.31
	Venezuelan Dry Forest	270,310.96
Oceanian	Central Polynesian	4,170.78
	East Melanesian	29,666.03
	Micronesian	2,169.66
Palaearctic	Aral Sea	67,545.96
	Arctic Desert	195,923.07
	Atlas Steppe	421,530.84
	Higharctic Tundra	952,904.05
	Hindu Kush Highlands	217,099.78
	Icelandian	101,590.86
	Iranian Desert	403,516.28
	Lake Ladoga	17,605.47
	Lowarctic Tundra	2,158,170.76
	Mongolian-Manchurian Steppe	2,605,044.00
	Pamir-Tian-Shan Highlands	643,192.62
	Pannonian	102,527.63
	Ryukyu Islands	2,478.63
	Takla-Makan-Gobi Desert	2,184,505.00
	Tibetan	1,268,088.80
	Turanian	2,116,777.00
	West Anatolian	37,608.71

World Heritage Sites & Udvardy Biomes in Asia



Geographic Projection
Compiled by M Wilson
Date printed: May 2004
Source: Udvardy, M.D.F. 1976. A Classification of the Biospherical Provinces of the World. IUCN Monogr. Switzerland & UNEP-WCMC WDPA V 6.1 Dataset.

Map 1

World Heritage Sites & Udvardy Biomes in Africa



World Heritage Sites

1. A r and Tchibanga Natural Reserves
2. Abdabra Atoll
3. Banc d'Arguin National Park
4. Bwindi Impenetrable National Park
5. Cliffs of Bandigara (Land of the Dogons)
6. Comoé National Park
7. Djia Faunal Reserve
8. Djoudj National Bird Sanctuary
9. Garamba National Park
10. Gough Island Wildlife Reserve
11. Greater St Lucia Wetland Park
12. Ichkeul National Park
13. Kahuzi - Biega National Park
14. Kilimanjaro National Park
15. Lake Malawi National Park
16. Lake Turkana National Parks
17. Mana Pools National Park, Sapi and Chewore Safari Areas
18. Mount Kenya National Park/Forest

19. Mount Nimba Reserves
20. Ngorongoro Conservation Area
21. Niokolo - Koba National Park
22. Okapi Faunal Reserve
23. Okhahlamba - Drakensberg Park
24. Parc National de Manovo
 - Gounda - St Floris
25. Rwenzori Mountains National Park
26. Selonga National Park
27. Selous Game Reserve
28. Serengeti National Park
29. Simen National Park
30. Ta National Park
31. Tassili N'Ajjer
32. Tsingy de Bemaraha Strict Nature Reserve
33. Vallée de Mai Nature Reserve
34. Victoria Falls/Mosi oa Tunya
35. Virunga National Park
36. W' National Park

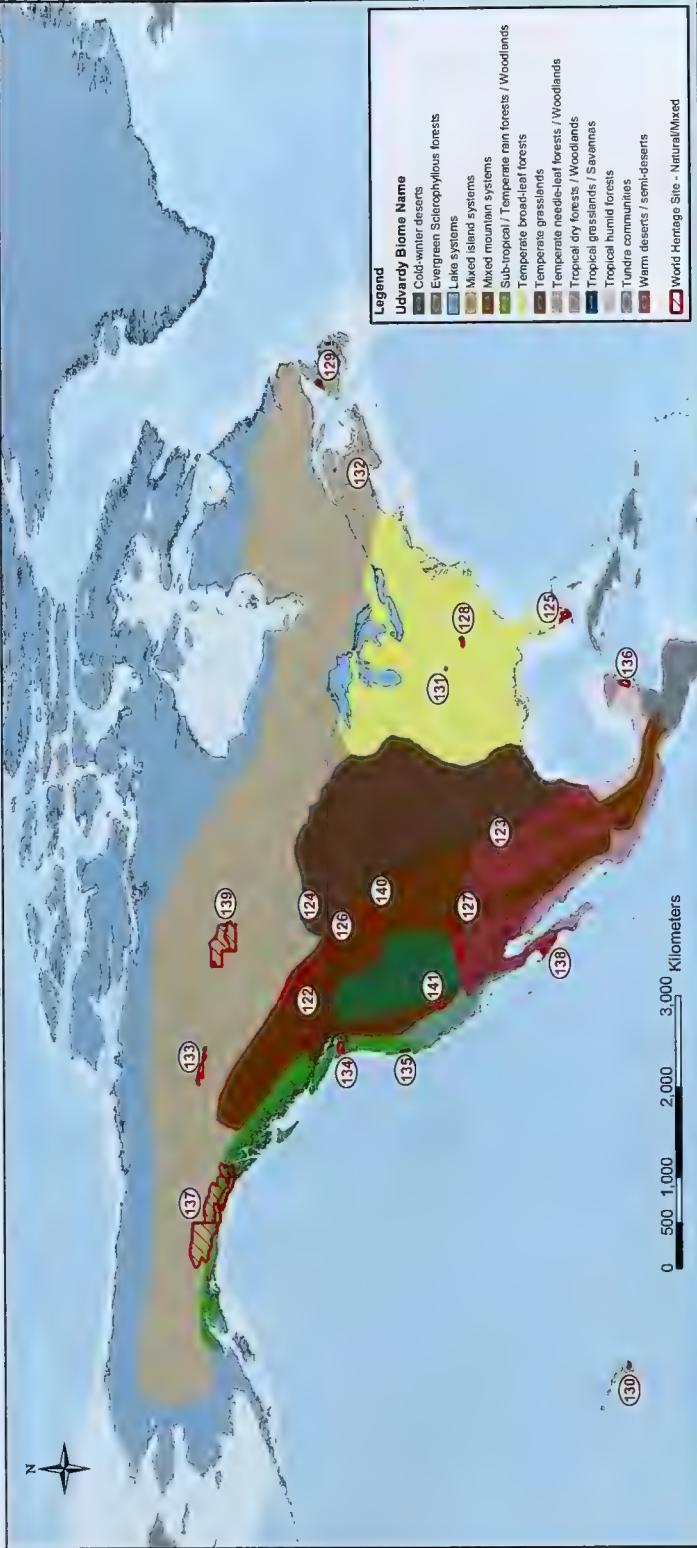
Geographic Projection

Compiled by: M Mason
Date printed: May 2004

Source. Udvardy, M D F. 1975 A Classification of the Biogeographical Provinces of the World. IUCN, Morges, Switzerland & UNEP-WCMC WDPA V 6 1 Dataset

Map 2

World Heritage Sites & Udvardy Biomes in North America



World Heritage Sites

122. Canadian Rocky Mountain Parks
123. Carlsbad Caverns
124. Dinosaur Provincial Park
125. Everglades National Park
126. Glacier and Waterton Lakes National Park
127. Grand Canyon National Park
128. Great Smoky Mountains National Park
129. Gros Morne National Park
130. Hawaii Volcanoes National Park
131. Mammoth Cave National Park
132. Miguasha Park
133. Nahanni National Park
134. Olympic National Park
135. Redwood National Park
136. Sian Ka'an
137. Tashiroshinri - Aiseki/ Kluane/ Wewangell - St Elias/ Glacier Bay
138. Whale Sanctuary of El Vizcaino
139. Wood Buffalo National Park
140. Yellowstone
141. Yosemite National Park

Geographic Projection
Compiled by M. Mason
Date printed: May 2004
Source: Udvardy, M.D.F. 1975. A Classification of the Biogeographical Provinces of the World. IUCN, Morges, Switzerland & UNEP-WCMC/WCPA / 61 (unpubl.)

Map 3

World Heritage Sites & Udvardy Biomes in South America



World Heritage Sites

- 142. Alejandro de Humboldt National Park
- 143. Área de Conservación Guanacaste
- 144. Belize Barrier Reef Reserve System
- 145. Brazilian Atlantic Islands: Fernando de Noronha and Atoll das Rocas Reserves
- 146. Canaima National Park
- 147. Central Amazon Conservation Complex
- 148. Central Suriname Nature Reserve
- 149. Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks
- 150. Cocos Island National Park
- 151. Darién National Park
- 152. Desembarco del Granma National Park
- 153. Discovery Coast Atlantic Forest Reserves
- 154. Galapagos Islands
- 155. Historic Sanctuary of Macchu Picchu
- 156. Huascarán National Park
- 157. Iguazú National Park
- 158. Iguazú National Park
- 159. Ischigualasto - Talampaya Natural Parks
- 160. Los Glaciares
- 161. Los Katíos National Park
- 162. Manu National Park
- 163. Morne Trois Pitons National Park
- 164. Noel Kempff Mercado National Park
- 165. Pantanal Conservation Complex
- 166. Península Valdés
- 167. Río Abiseo National Park
- 168. Río Plátano Biosphere Reserve
- 169. Sangay National Park
- 170. Southeast Atlantic Forest Reserves
- 171. Talamancas Range - La Amistad Reserves
- 172. Tikal National Park

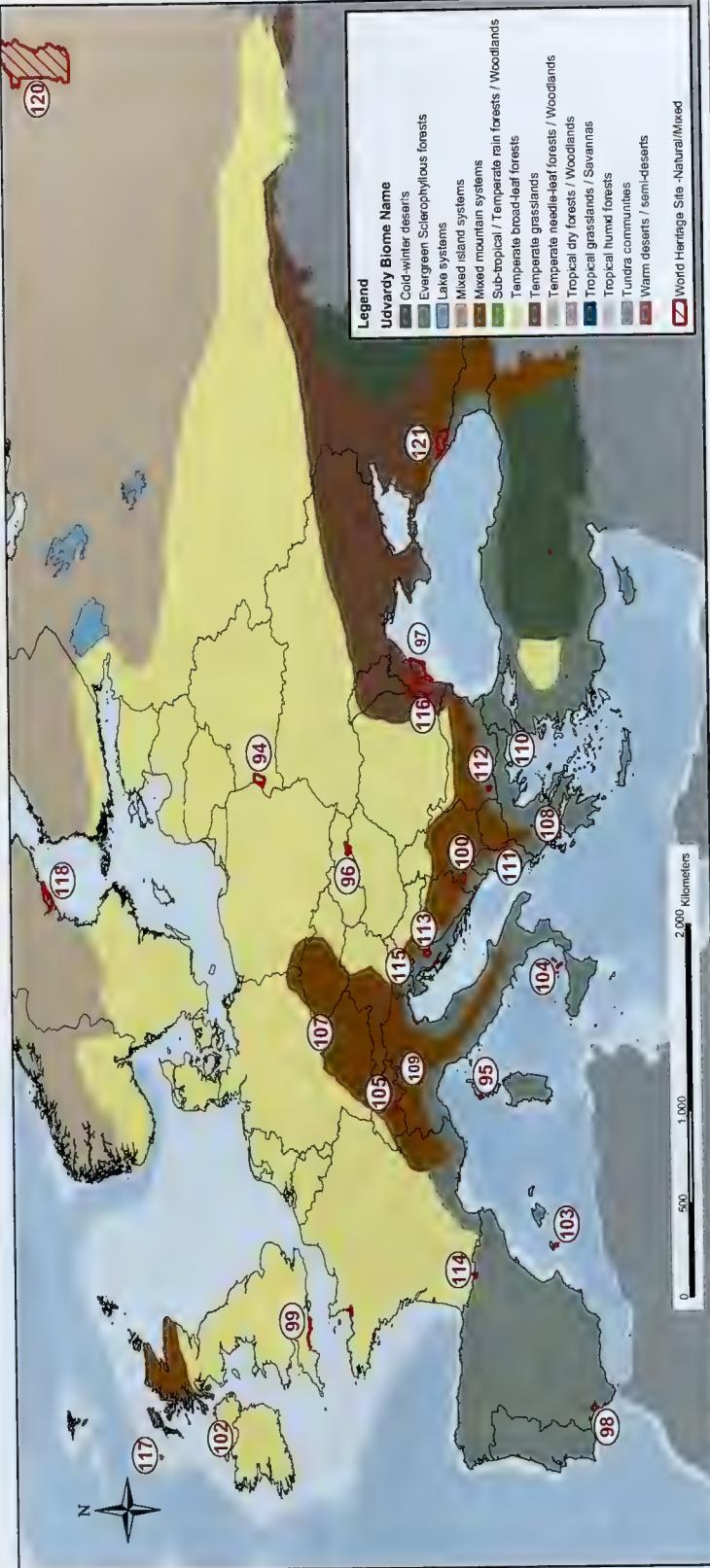
Geographic Projection

Compiled by: M. Mason
Date printed: May 2004

Source: Udvardy, M D F. 1975 A Classification of the Biogeographical Provinces of the World. IUCN, Morges, Switzerland & UNEP-WCMC WDPA V 6.1 dataset

Map 4

Distribution of World Heritage Sites & Uvdary Biomes in Europe



Compiled by M. Mason, P. Tuladhar
Date printed: May 2004
Source: Uvdary, M.D.F. 1975 A Classification of the Biogeographical Provinces of the World IUCN, Morges, Switzerland & UNEP/WCMC WDPA V.1 Database

Map 5

- 118. The High Coast
- 119. The Laponian Area
- 120. Virgin Komi Forests
- 121. Western Caucasus
- 122. Wieliczka Salt Mine
- 106. Laurisilva of Madeira
- 107. Messel Pit Fossil Site
- 108. Meteora
- 109. Monte San Giorgio
- 110. Mount Athos
- 111. Öhrid Region with its Cultural/Historical Aspect and its Natural Environment
- 112. Pinn National Park
- 113. Plitvice Lakes National Park
- 114. Pyrenees - Mont Perdu (France and Spain)
- 115. Skocjan Caves
- 116. Srebarna Nature Reserve
- 117. St. Kilda

- 94. Belovezhskaya Pushcha / Białowieża National Park (Belarus and Poland)
- 95. Cape Għajnejha, Cape Pinto & Scandola Nature Reserve in Corsica
- 96. Caves of Aggtelek and Slovak Karst (Hungary and Slovakia)
- 97. Danube Delta
- 98. Doñana National Park
- 99. Dorset and East Devon Coast
- 100. Durmitor National Park
- 101. Garajonay National Park
- 102. Giant's Causeway and Causeway Coast
- 103. Ibiza: Biodiversity and Culture
- 104. Isla de El Hierro (Aeolian Islands)
- 105. Jura Mountains
- 106. Laurisilva of Madeira
- 107. Messel Pit Fossil Site
- 108. Meteora
- 109. Monte San Giorgio
- 110. Mount Athos
- 111. Öhrid Region with its Cultural/Historical Aspect and its Natural Environment
- 112. Pinn National Park
- 113. Plitvice Lakes National Park
- 114. Pyrenees - Mont Perdu (France and Spain)
- 115. Skocjan Caves
- 116. Srebarna Nature Reserve
- 117. St. Kilda
- 118. The High Coast
- 119. The Laponian Area
- 120. Virgin Komi Forests
- 121. Western Caucasus
- 122. Wieliczka Salt Mine

World Heritage Sites & Urdvardy Biomes in Oceania/Australasia

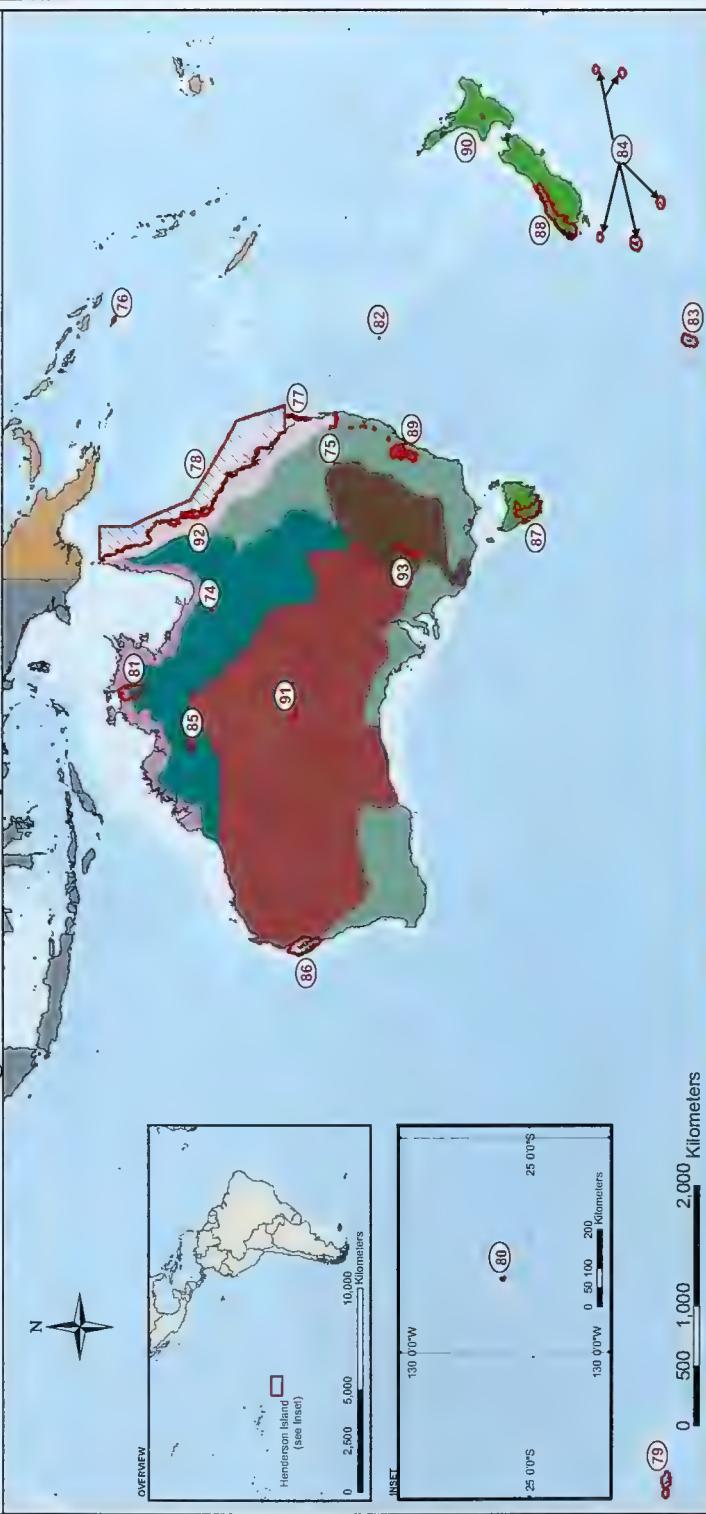


Plate-Cartier Projection
Compiled by M. Mason
Date printed May 2004
Source: Olsen, D. M. and E. Dinetti. The Global
2000 Project: A contribution for global conservation.
(PDF file). Annals of the Missouri Botanical Garden
89:125-128 & UNEP-WCMC WCPA V 6.1 Dataset

Map 6

Urdvardy Biome Name	Legend
Evergreen sclerophyllous forests	
Mixed island systems	
Sub-tropical / temperate rain forests / Woodlands	
Tropical grasslands / Savannas	
Tropical humid forests	
Warm deserts / semi-deserts	
World Heritage Site: Natural/Mixed	

2.2 WWF Global 200 Ecoregions

The WWF Global Ecoregions scheme, based on a combination of biogeographical realms, and floristic and zoogeographic provinces, divides the world's habitats into 867 different "ecoregions". Each is given a name and an alphanumeric code, which starts with the two letters designating the biogeographic realm to which the ecoregion belongs. The ecoregions are generally large and span a variety of habitats.

The most biologically outstanding of the 867 ecoregions that deserve the most urgent conservation attention, and are therefore considered priorities for conservation action, are referred to as the "Global 200" (G200). There are actually 238 G200 Ecoregions, of which 195 are terrestrial (including 53 freshwater) and 43 marine (see Maps 7-12). Each G200 Ecoregion can consist of several of the 867 ecoregions grouped together, and is also given a different name (often consisting of a hyphenated but shortened version of its constituent parts) and numbering system by WWF. For example the Caucasus-Anatolian-Hyrcanian temperate forests (G200 Ecoregion 78) is composed of six ecoregions: Caspian Hyrcanian mixed forests (Ecoregion PA 0407); Caucasus mixed forests (PA 0408); Elburz Range forest steppe (PA 0507); Euxine-Colchic broadleaf forests (PA 0422); Kopet Dag woodlands and forest steppe (PA 1008) and Northern Anatolian conifer and deciduous forests (PA 0515).

Forty-nine WH sites (39.8%) do not coincide with any terrestrial G200 Ecoregion. The 123 (60.2%) WH Sites that do, coincide with 92 (64.8%) of the 142 terrestrial G200 Ecoregions (Table 6). Approximately 650,000 km² of the total area of WH Sites overlap with terrestrial G200 Ecoregions. Terrestrial G200 Ecoregions are usually much larger (approximately 390,000 km² on average) than WH sites (which are roughly 10,000 km² on average), so most (95) of these 123 WH Sites occur in only one ecoregion. However, some sites include parts of more than one terrestrial ecoregion: 21 WH Sites straddle two G200 Ecoregions, five encompass three G200 Ecoregions, and two sites, Lorentz National Park and the Three Parallel Rivers of Yunnan Protected Areas include parts of four.

The 50 terrestrial G200 Ecoregions that are not in WH Sites are shown in Table 7.

The 53 freshwater G200 Ecoregions are generally even larger than the strictly terrestrial ecoregions, covering on average some 606,000 km². Analysis is complicated by the fact that the freshwater ecoregions are superimposed on the terrestrial ecoregions, and are meant to cover all the freshwater habitats within the underlying G200 Ecoregions. An area-based calculation therefore offers no advantage over a simple presence-absence tabulation. A total of 69 WH Sites (40.1%) occur in 30 (56.6%) of the 53 freshwater G200 Ecoregions (Table 8). Sixty-three of these WH Sites (91.3%) only occur in one freshwater G200 Ecoregion, but four WH Sites include parts of two freshwater G200 Ecoregions, and two (Canaima National Park in Venezuela and the Three Parallel Rivers of Yunnan Protected Areas in China) include parts of three. The 23 freshwater G200 Ecoregions with no WH Sites are shown in Table 9.

A total of 25 out of 43 (58.1%) marine G200 Ecoregions occur in 39 (22.7%) WH Sites (Table 10). Because marine G200 Ecoregions are huge, almost all (38 out of 39) WH Sites only encompass one marine ecoregion. However, one site, the Volcanoes of Kamchatka, has a coastline which includes parts of two marine ecoregions: 204 Okhotsk Sea and 197 Bering Sea. The 18 marine G200 Ecoregions not occurring in WH Sites are shown in Table 11.

Table 6: World Heritage Sites in Terrestrial Global 200 Ecoregions

G200 Code	G200 Region name	World Heritage Site	Country	Area in G200 region (km ²)
1	Guinean Moist Forests	Mount Nimba Strict Nature Reserve Tai National Park	Côte d'Ivoire + Guinea Côte d'Ivoire	150.66 4,382.27
4	Northeastern Congo Basin Moist Forests	Kahuzi-Biega National Park Okapi Wildlife Reserve Virunga National Park	DR of the Congo	5,039.80 13,937.23 606.53
5	Central Congo Basin Moist Forests	Salonga National Park	DR of the Congo	34,655.38
6	Western Congo Basin Moist Forests	Dja Faunal Reserve	Cameroon	6,263.93
7	Albertine Rift Montane Forests	Bwindi Impenetrable National Park Kahuzi-Biega National Park Virunga National Park	Uganda DR of the Congo	292.04 601.73 3,739.43
8	East African Coastal Forests	Selous Game Reserve	UR Tanzania	7,640.88
11	Seychelles and Mascarenes Moist Forests	Aldabra Atoll	Seychelles	160.15 0.19
14	Southern New Guinea Lowland Forests	Vallée de Mai Nature Reserve	Indonesia	4,223.55
15	New Guinea Montane Forests	Lorentz National Park	Indonesia	4,938.11
16	Solomons-Vanuatu-Bismarck Moist Forests	East Rennell	Solomon Islands	311.55
17	Queensland Tropical Forests	Great Barrier Reef Wet Tropics of Queensland	Australia	383.88 6,935.46
19	Lord Howe and Norfolk Island Forests	Lord Howe Island Group	Australia	8.28
21	Sri Lankan Moist Forests	Sinharaja Forest Reserve	Sri Lanka	95.81
22	North Indochina Subtropical Moist Forests	Three Parallel Rivers of Yunnan Protected Areas	China	441.66
23	Southeast China-Hainan Moist Forests	Ha Long Bay Mount Wuyi	Vietnam China	5.16 1,147.69
25	Annamite Range Moist Forests	Phong Nha-Ke Bang National Park	Vietnam	895.94
26	Sumatran Islands Lowland and Montane Forests	Ujung Kulon National Park	Indonesia	27.34
28	Palawan Moist Forests	Puerto-Princesa Subterranean River National Park	Philippines	50.90
29	Kayah-Karen/Tenasserim Moist Forests	Thungyai-Huai Kha Khaeng Wildlife Sanctuaries	Thailand	5,834.90
31	Borneo Lowland and Montane Forests	Kinabalu Park	Malaysia	170.62

			Gunung Mulu National Park			
32	Nansei Shoto Archipelago Forests	Yakushima	Japan	459.37	535.34	
34	Naga-Manapuri-Chin Hills Moist Forests	Kaziranga National Park	India	45.88		
37	Greater Antillean Moist Forests	Alejandro de Humboldt National Park Desembarco del Granma National Park	Cuba	611.55		
38	Talamancan-Isthmian Pacific Forests	Área de Conservación Guanacaste Talamanca Range-La Amistad Reserves/La Amistad National Park	Costa Rica	67.17	163.50	
39	Chocó-Darién Moist Forests	Darién National Park Los Katíos National Park	Panama	1,746.87	5,505.21	
40	Northern Andean Montane Forests	Sangay National Park	Colombia	588.37		
42	Guianan Moist Forests	Central Suriname Nature Reserve	Ecuador	4,062.94		
43	Napo Moist Forests	Río Abiseo National Park	Suriname	15,427.82		
44	Río Negro-Juruá Moist Forests	Central Amazon Conservation Complex	Peru	498.27		
45	Guayanan Highlands Moist Forests	Canaima National Park Central Suriname Nature Reserve	Brazil	49,011.61	16,975.85	
46	Central Andean Yungas	Historic Sanctuary of Machu Picchu Huascaran National Park Manu National Park	Venezuela Suriname	828.90	217.10	
47	Southwestern Amazonian Moist Forests	Noel Kempff Mercado National Park Atlantic Forest Southeast Reserves	Peru Bolivia	1,519.67	210.99	
48	Atlantic Forests	Discovery Coast Atlantic Forest Reserves Iguacu National Park Iguazu National Park	Brazil	8,535.62	6,309.30	
49	Southern Pacific Islands Forests	Henderson Island	Argentina	13,779.43	17,266.03	
50	Hawaii Moist Forests	Hawai Volcanoes National Park	UK	1,390.59	1,390.59	
51	Madagascar Dry Forests	Tsingy de Bemaraha Strict Nature Reserve	USA	593.84	593.84	
52	Nusu Tenggara Dry Forests	Komodo National Park	Bolivia	41.19	41.19	
58	Chiquitano Dry Forests	Noel Kempff Mercado National Park Pantanal Conservation Complex	Bolivia Brazil	145.83	1,476.94	
60	Hawaii Dry Forest	Hawai Volcanoes National Park	Indonesia	1,058.87	549.59	
62	Greater Antillean Pine Forests	Alejandro de Humboldt National Park	USA	6,735.51	6,735.51	
63	Mesoamerican Pine-Oak Forests	Río Platano Biosphere Reserve	Cuba	569.13	1,476.94	
64	Eastern Australia Temperate Forests	Central Eastern Rainforest Reserves	Honduras	81.21	81.21	
				616.93	616.93	
				2,487.27	2,487.27	

		Fraser Island Great Barrier Reef		2,250.30 13.06 10,347.50
65	Tasmanian Temperate Rainforests	The Greater Blue Mountains Area Tasmanian Wilderness (M)	Australia	14,836.14
66	New Zealand Temperate Forests	Te Wahipounamu-South West New Zealand Tongariro National Park (M)	New Zealand	14,721.06 683.76
67	Eastern Himalayan Broadleaf and Conifer Forests	Sagarmatha National Park	Nepal	25.68
69	Appalachian and Mixed Mesophytic Forests	Great Smoky Mountains National Park	USA	1,974.83
70	Southwest China Temperate Forests	Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area	China	261.87
71	Russian Far East Broadleaf and Mixed Forests	Central Sikhote-Alin	Russian Federation	9,828.21
72	Pacific Temperate Rainforests	Kluane/Wrangell-St Elias/Glacier Bay/Tatshenshini-Alsek Olympic National Park Redwood National Park	USA/Canada USA	3,933.77 3,496.92 418.98
74	Sierra Nevada Coniferous Forests	Yosemite National Park	USA	3,048.57
77	European-Mediterranean Montane Forests	Caves of Agtelek Karst and Slovák Karst Durmitor National Park Jungfrau-Aletsch-Bietschhorn Monte San Georgio Plitvice Lakes National Park Pyréneés-Mont Perdu (M) Western Caucasus	Hungary/Slovakia Serbia/Montenegro Switzerland Bulgaria Croatia France/Spain Russian Federation	57.76 1,245.73 537.68 23.91 291.49 589.81 257.80 18.05
78	Caucasus-Anatolian-Hircanian Temperate Forests	Western Caucasus	Russian Federation	3,577.31
79	Altai-Sayan Montane Forests	Golden Mountains of Altai Lake Baikal Uvs Nuur Basin	Russian Federation Mongolia/Russ., Fed	17,005.25 11,493.35 12,548.41
80	Hengduan Shan Conifer Forests	Huanglong Scenic and Historic Interest Area Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area (M) Three Parallel Rivers of Yunnan Protected Areas	China	138.70 117.69 20,233.43
81	Muskwa/Slave Lake Boreal Forests	Kluane/Wrangell-St Elias/Glacier Bay/Tatshenshini-Alsek Nahanni National Park Wood Buffalo National Park	Canada/USA Canada	4,488.34 104.00 14,985.15
82	Canadian Boreal Taiga	Nahanni National Park	Canada	4,587.88

		Wood Buffalo National Park		122.81
83	Ural Mountains Taiga and Tundra	Virgin Komi Forests	Russian Federation	26,118.33
84	Central and Eastern Siberian Taiga	Lake Baikal	Russian Federation	23,337.26
85	Kamchatka Taiga and Grasslands	Volcanoes of Kamchatka	Russian Federation	33,735.86
87	East African Acacia Savannahs	Mount Kenya National Park/Natural Forest Ngorongoro Conservation Area Serengeti National Park	Kenya UR Tanzania	4.68 4,942.54 13,307.29
88	Central and Eastern Miombo Woodlands	Selous Game Reserve	UR Tanzania	40,207.62
89	Sudanian Savannahs	Manovo-Gounda St. Floris National Park	Central African Rep	19,179.15
90	Northern Australia and Trans-Fly Savannahs	Great Barrier Reef Kakadu National Park (M) Wet Tropics of Queensland	Australia	453.96 18,813.21 49.14
91	Terai-Duar Savannahs and Grasslands	Royal Chitwan National Park	Nepal	464.09
92	Llanos Savannahs	Canaima National Park	Venezuela	566.31
93	Cerrado Woodlands and Savannahs	Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks Noel Kempff Mercado National Park	Brazil Bolivia	5,487.90 3,319.83
94	Northern Prairies	Dinosaur Provincial Park	Canada	38.44
95	Patagonian Steppe	Los Glaciares Península Valdés	Argentina	587.08 3,837.08
98	Zambezian Flooded Savannahs	Selous Game Reserve	UR Tanzania	15.71
100	Everglades Flooded Grasslands	Everglades National Park	USA	3,358.02
101	Pantanal Flooded Savannahs	Pantanal Conservation Complex	Brazil	965.88
102	Ethiopian Highlands	Simien National Park Kilimanjaro National Park Mount Kenya National Park/Natural Forest Rwenzori Mountains National Park Virunga National Park	Ethiopia UR Tanzania Kenya Uganda DR of the Congo	134.50 669.65 630.46 651.44 471.39
104	East African Moorlands	Lorenz National Park Ukhahlamba/Drakensberg Park (M)P	South Africa Indonesia Malaysia	1,665.16 2,993.56 586.11
105	Drakensberg Montane Woodlands and Grasslands	Kinabalu Park	Peru	828.56
106	Central Range Subalpine Grasslands	Rio Abiseo National Park (M) Sangay National Park	Ecuador	1,634.68
107	Kinabalu Montane Shrublands	Huanglong Scenic and Historic Interest Area Juzhaigou Valley Scenic and Historic Interest Area	China	12.59 611.82

		Three Parallel Rivers of Yunnan Protected Areas	Nepal China	569.50 383.79 53.10
112	Eastern Himalayan Alpine Meadows	Sagarmatha National Park		
115	Fенно-Scandia Alpine Tundra and Taiga	Three Parallel Rivers of Yunnan Protected Areas	Sweden	7,906.39
119	Southwestern Australia Forests and Scrub	Laponian Area (M)	Australia	4,584.46
120	Southern Australia Mallee and Woodlands	Shark Bay, Western Australia	Australia	1.71 2,630.12
		Australian Fossil Mammal Sites - Naracoorte Willandra Lakes Region (M)		
		Cape Girolata, Cape Porto, Scandola Nature Reserve and the Piana Calanches in Corsica	France	56.83
		Dorñana National Park	Spain	481.02
		Garajonay National Park		65.11
		Göreme National Park and the Rock Sites of Cappadocia (M)	Turkey	162.84
		Hierapolis-Pamukkale (M)		4.87
		Ibiza, biodiversity and culture (M)	Spain	33.65
		Ichkeul National Park	Tunisia	117.60
		Isole Eolie (Aeolian Islands)	Italy	55.28
		Laurisilva of Madeira	Portugal	127.85
		Meteora (M)		4.54
		Mount Athos (M)	Greece	0.32
		Ohrid Region with its Cultural and Historical Aspect and its Natural Environment (M)	FYR Macedonia	248.97
		Skocjan Caves	Slovenia	3.98
		Arabian Oryx Sanctuary	Saudi Arabia	7,632.88
		Shark Bay, Western Australia	Australia	1,773.87
127	Arabian Highlands and shrublands	Uluru-Kata Tjuta National Park (M)	Australia	1,254.50
128	Carnavon Xeric Shrubs	Whale Sanctuary of El Vizcaíno	Mexico	2,657.64
129	Great Sandy-Tamami Deserts	Carlsbad Caverns National Park	USA	37.85
130	Sonoran-Baja Deserts	Galápagos Islands	Ecuador	8,014.42
131	Chihuahuan-Tehuacan Deserts	Huascaran National Park	Peru	372.60
132	Galápagos Islands Scrub	Lorentz National Park	Indonesia	2,424.48
133	Atacama-Sechura Deserts	Sundarbans National Park	Bangladesh	901.55
138	New Guinea Mangroves	The Sundarbans	India	1,045.33
139	Sundarbans Mangroves			
			Total	648,034.74

Table 7: Terrestrial Global 200 Ecoregions not occurring in World Heritage Sites

G200 Code	G200 Region Name	Total Area of G200 (km ²)
2	Congolian Coastal Forests	242,780.32
3	Cameroon Highlands Forests	39,191.71
9	Eastern Arc Montane Forests	23,658.87
10	Madagascar Forests and Shrublands	312,961.30
12	Sulawesi Moist Forests	192,146.08
13	Moluccas Moist Forests	46,226.93
18	New Caledonia Moist Forests	14,562.17
20	Southwestern Ghats Moist Forests	46,408.92
24	Taiwan Montane Forests	35,979.37
27	Philippines Moist Forests	279,015.85
30	Peninsular Malaysia Lowland and Montane Forests	142,681.27
33	Eastern Deccan Plateau Moist Forests	341,134.44
35	Cardamom Mountains Moist Forests	44,248.33
36	Western Java Montane Forests	26,284.78
41	Coastal Venezuela Montane Forests	14,340.59
53	New Caledonia Dry Forests	4,420.24
54	Indochina Dry Forests	444,336.46
55	Chhota-Nagpur Dry Forests	122,437.49
56	Southern Mexican Dry Forests	315,015.01
57	Tumbesian-Andean Valleys Dry Forests	103,189.10
59	Atlantic Dry Forests	115,107.67
61	Sierra Madre Oriental and Occidental Pine-Oak Forests	289,437.30
68	Western Himalayan Temperate Forests	95,537.24
73	Klamath-Siskiyou Coniferous Forests	50,298.06
75	Southeastern Coniferous and Broadleaf Forests	584,409.78
76	Valdivian Temperate Rain Forests / Juan Fernández Islands	248,235.36
86	Horn of Africa Acacia Savannas	1,053,887.71
96	Daurian/Mongolian Steppe	1,096,199.91
97	Sudd-Sahelian Flooded Grasslands and Savannas	244,586.88
99	Rann of Kutch Flooded Grasslands	27,910.49
103	Southern Rift Montane Woodlands	33,497.78
109	Central Andean Dry Puna	255,634.84
111	Middle Asian Montane Woodlands and Steppe	881,003.79
113	Alaskan North Slope Coastal Tundra	227,241.63
114	Canadian Low Arctic Tundra	796,523.46
116	Taimyr and Russian Coastal Tundra	1,177,260.51
117	Chukhote Coastal Tundra	301,671.83
118	Fynbos	78,557.40
121	California Chaparral and Woodlands	121,262.95
122	Chilean Matorral	148,509.26
124	Namib-Karoo-Kaokoveld Deserts and Shrublands	805,930.10
125	Madagascar Spiny Thicket	123,097.33
126	Socotra Island Desert	3,818.16
134	Central Asian Deserts	1,317,708.36
135	Gulf of Guinea Mangroves	30,928.62
136	East African Mangroves	16,072.34
137	Madagascar Mangroves	5,205.38
140	Greater Sundas Mangroves	37,446.97
141	Guianan-Amazon Mangroves	?

Note: There are no area polygons for G200 Ecoregion 141, the Guianan-Amazon Mangroves, in the WWF-provided GIS dataset.

Table 8: World Heritage Sites in Freshwater Global 200 Ecoregions

G200 Code	G200 Ecoregion	World Heritage Site Name	Country
144	Mekong River	Three Parallel Rivers of Yunnan Protected Areas	China
145	Colorado River	Grand Canyon National Park	USA
147	Amazon River & Flooded Forests	Central Amazon Conservation Complex	Brazil
148	Orinoco River & Flooded Forests	Canaima National Park	Venezuela
149	Yangtze River & Lakes	Huanglong Scenic and Historic Interest Area Jiuzhaigou Valley Scenic and Historic Interest Area Mount Emei Scenic Area, incl. Leshan Giant Buddha Scenic Area Mount Huangshan Three Parallel Rivers of Yunnan Protected Areas Wulingyuan Scenic and Historic Interest Area	China
150	Congo Basin Piedmont Rivers and Streams	Dja Faunal Reserve Manovo-Gounda St. Floris National Park Garamba National Park Kahuzi-Biega National Park Okapi Wildlife Reserve Salonga National Park Virunga National Park	Cameroon Central African Rep. DR of the Congo
151	Mississippi Piedmont Rivers and Streams	Great Smoky Mountains National Park Mammoth Cave National Park	USA
152	Upper Amazon Rivers and Streams	Canaima National Park Central Amazon Conservation Complex Historic Sanctuary of Machu Picchu Huascarán National Park Manu National Park Rio Abiseo National Park Sangay National Park	Venezuela Brazil Peru Ecuador
153	Upper Paraná Rivers and Streams	Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks Iguazu National Park	Brazil Argentina
154	Brazilian Shield Amazonian Rivers and Streams	Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks Noel Kempff Mercado National Park	Brazil Bolivia
159	Danube River Delta	Danube Delta Srebarna Nature Reserve	Romania Bulgaria
161	Upper Guinea Rivers and Streams	Mount Nimba Strict Nature Reserve Taï National Park	Côte d'Ivoire + Guinea Côte d'Ivoire
165	New Guinea Rivers and Streams	Lorentz National Park	Indonesia
167	Kimberley Rivers and Streams	Purnululu National Park	Australia
169	Eastern Australia Rivers and Streams	Australian Fossil Mammal Sites - Naracoorte Central Eastern Rainforest Reserves (Australia) Fraser Island Great Barrier Reef	Australia

		Tasmanian Wilderness The Greater Blue Mountains Area Wet Tropics of Queensland Willandra Lakes Region	
172	Southwestern Sri Lanka Rivers	Sinharaja Forest Reserve	Sri Lanka
173	Salween River	Three Parallel Rivers of Yunnan Protected Areas	China
174	Sundaland Rivers and Swamps	Kinabalu Park Gunung Mulu National Park	Malaysia
175	Southeastern Rivers and Streams	Everglades National Park	USA
176	Pacific Coastal Rivers and Streams	Redwood National Park Yosemite National Park	USA
177	Gulf of Alaska Coastal Rivers and Streams	Kluane/Wrangell-St Elias/Glacier Bay/Tatshenshini-Alsek Olympic National Park	Canada/USA USA
178	Guianan Freshwater	Canaima National Park Central Suriname Nature Reserve	Venezuela Suriname
179	Greater Antillean Freshwater	Alejandro de Humboldt National Park Desembarco del Granma National Park	Cuba
180	Balkan Rivers and Streams	Durmitor National Park	Serbia & Montenegro
		Meteora Mount Athos	Greece
		Ohrid Region with its Cultural and Historical Aspect and its Natural Environment	FYR Macedonia
		Pirin National Park	Bulgaria
181	Russian Far East Rivers and Wetlands	Central Sikhote-Alin Volcanoes of Kamchatka	Russian Federation
182	Rift Valley Lakes	Bwindi Impenetrable National Park Rwenzori Mountians National Park	Uganda
		Lake Malawi National Park	Malawi
		Ngorongoro Conservation Area Serengeti National Park	UR Tanzania
		Virunga National Park Kahuzi-Biega National Park	DR of the Congo
		Ischigualasto-Talampaya Natural Parks	Argentina
183	High Andean Lakes	Lake Baikal	Russian Federation
184	Lake Baikal	Carlsbad Caverns National Park	USA
194	Chihuahuan Freshwater	Göreme National Park and the Rock Sites of Cappadocia	Turkey
195	Anatolian Freshwater	Hierapolis-Pamukkale	

Table 9: Freshwater Global 200 Ecoregions not occurring in World Heritage Sites

G200 Code	G200 Freshwater Region	Area of G200 Region (km ²)
143	Congo River and Flooded Forests	515,365.75
146	Lower Mississippi River	244,584.50
155	Niger River Delta	52,776.13
156	Indus River Delta	40,518.40
157	Volga River Delta	86,185.75
158	Mesopotamian Delta and Marshes	101,430.42
160	Lena River Delta	30,690.85
162	Madagascar Freshwater	160,951.42
163	Gulf of Guinea Rivers and Streams	521,159.17
164	Cape Rivers and Streams	130,965.78
166	New Caledonia Rivers and Streams	15,329.23
168	Southwest Australia Rivers and Streams	326,893.91
170	Xi Jiang Rivers and Streams	406,443.19
171	Western Ghats Rivers and Streams	158,089.22
185	Lake Biwa	7,082.64
186	Cameroonian Crater Lakes	11,216.12
187	Lakes Kutubu & Sentani	12,249.01
188	Central Sulawesi Lakes	127,327.80
189	Philippines Freshwater	88,368.89
190	Lake Inle	2,641.91
191	Yunnan Lakes and Streams	72,434.98
192	Mexican Highland Lakes	379,050.31
193	Central Australian Freshwater	1,338,250.90

Table 10: World Heritage Sites in Global 200 Marine Ecoregions

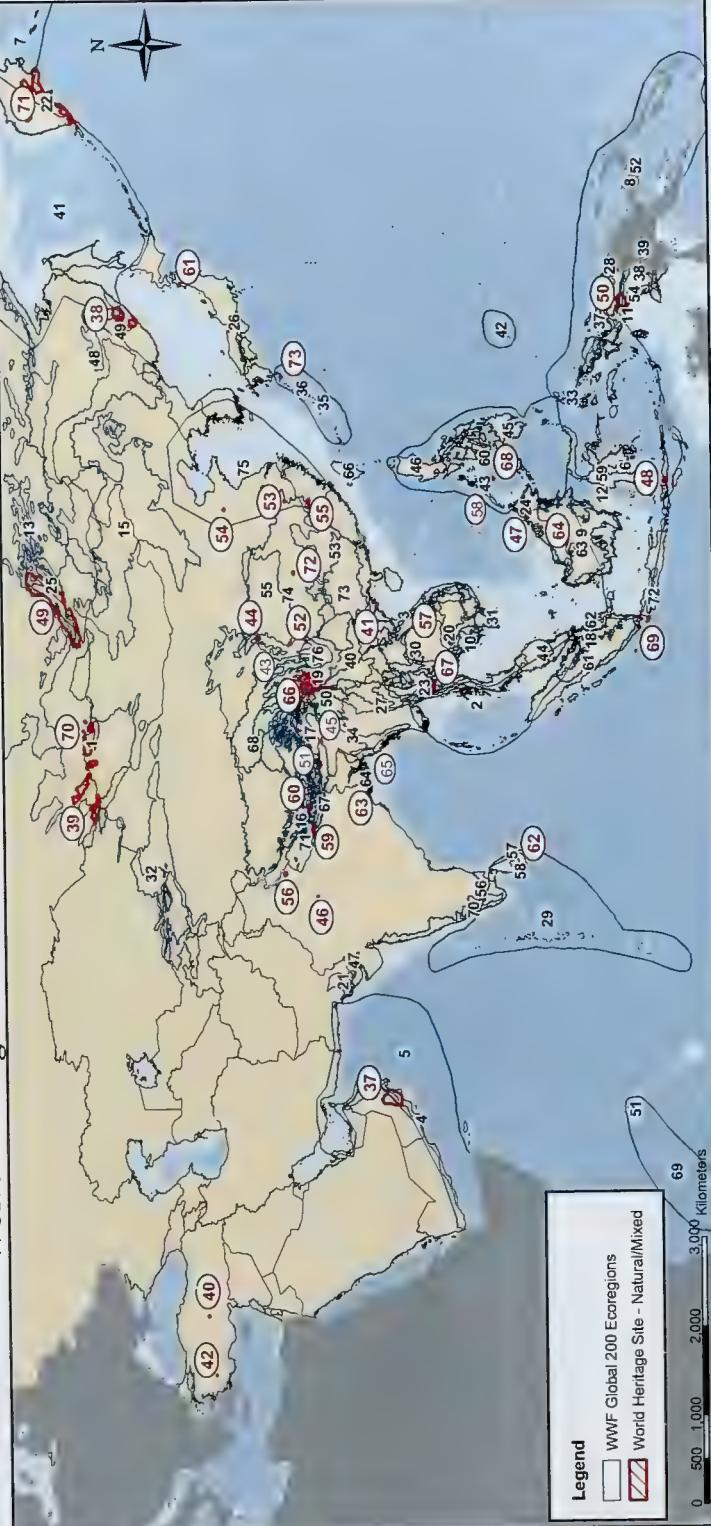
G200 Code	G200 Marine Region	World Heritage Site	Country
197	Bering Sea	Volcanoes of Kamchatka	Russian Federation
199	Mediterranean Sea	Cape Girolata, Cape Porto, Scandola Nature Reserve and the Piana Calanches in Corsica	France
		Durmitor National Park	Serbia & Montenegro
		Doñana National Park	Spain
		Ibiza, Biodiversity and Culture	Italy
		Isole Eolie (Aeolian Islands)	
200	Northeast Atlantic Shelf Marine	Dorset and East Devon Coast	UK
		Giant's Causeway and Causeway Coast	
		St. Kilda	
201	Grand Banks	The High Coast	Sweden
		Gros Morne National Park	Canada
204	Okhotsk Sea	Miguasha Park	
205	Patagonian Southwest Atlantic	Volcanoes of Kamchatka	Russian Federation
206	Southern Australian Marine	Península Valdés	Argentina
207	New Zealand Marine	Tasmanian Wilderness	Australia
208	California Current	New Zealand Sub-Antarctic Islands	New Zealand
		Te Wahipounamu - South West New Zealand	
211	Agulhas Current	Redwood National Park	USA
		Whale Sanctuary of El Vizcaino	Mexico
212	Western Australia Marine	Greater St Lucia Wetland Park	South Africa
213	Panama Bight	Shark Bay, Western Australia	Australia
215	Galápagos Marine	Darién National Park	Panama
216	Canary Current	Galápagos Islands	Ecuador
217	Nansei Shoto	Banc d'Arguin National Park	Mauritania
218	Sulu-Sulawesi Seas	Yakushima	Japan
219	Bismarck-Solomon Seas	Tubbataha Reef Marine Park	Philippines
220	Banda-Flores Sea	East Rennell	Solomon Islands
222	Great Barrier Reef	Komodo National Park	Indonesia
223	Great Barrier Reef	Great Barrier Reef	Australia
		Wet Tropics of Queensland	
227	Lord Howe-Norfolk Islands Marine	Lord Howe Island Group	Australia
		Hawaiian Marine	USA
234	West Madagascar Marine	Hawaii Volcanoes National Park	Seychelles
235	Mesoamerican Reef	Aldabra Atoll	Belize
		Belize Barrier-Reef Reserve system	Mexico
236	Greater Antillean Marine	Sian Ka'an	
		Alejandro de Humboldt National Park	Cuba
		Desembarco del Granma National Park	
238	Northeast Brazil Shelf Marine	Everglades National Park	USA
		Brazilian Atlantic Islands	Brazil

Note: These include WH Sites with marine components and coastline in the G200 Marine Ecoregions.

Table 11: Marine Global 200 Ecoregions not occurring in World Heritage Sites

G200 Code	G200 Marine Ecoregion Name
196	Antarctic Peninsula and Weddell Sea
198	Barents-Kara Seas
202	Chesapeake Bay
203	Yellow Sea
209	Benguela Current
210	Humboldt Current
214	Gulf of California
221	New Caledonia Barrier Reef
224	Palau Marine
225	Andaman Sea
226	Tahitian Marine
228	Rapa Nui
229	Fiji Barrier Reef
230	Maldives, Chagos, Lakshadweep Atolls
231	Red Sea
231	Arabian Sea
233	East African Marine
237	Southern Caribbean Sea

World Heritage Sites & WWF Global 200 Ecoregions in Asia



WWF Global 200 Ecoregions	
1. Indus-Sindhu Riverine Forests	67. Tadou-Songnen grasslands
2. Arunachal Pradesh moist forests	68. Philippine Freshwater
3. Andaman Saddle moist forests	69. Khorat-Kon Tonsayen moist forests
4. Arunachal Pradesh Subtropical	70. Kumbhalgarh woodlands
Pearl Riverine Subtropical	71. Lake Baikal
River National Park	72. Lake Erhai
5. Royal Chitwan National Park	73. Ruoergai Forests and mixed forests
Sagarmatha National Park	74. Shilong Plateau
60. Shennongjia Mountain Park	75. Shiretoko National Park
61. Sichuan Giant Panda Reserve	76. Shuanghe River & Swamps
Suntangtang National Park	77. Yunnan Lakes & Streams
63. Tianshan Forest Reserve	78. Yunnan Plateau Alpine and Subalpine
64. The Gurgudabalan National Park	79. Northern China Temperate forests
Inland Xizang	80. Southwest China moist forests
44. Jiazhigou Valley (Cenozoic and Holocene)	81. Miao-Meng Jiang He moist forests
45. Jinggangshan National Park	82. Mengla-Tengchong Forests
46. Kunlun National Park	83. Nanling subtropical forests
47. Kunlun Shan	84. North China Monsoon Forests
48. Kuroko National Park	85. Eastern Hemispheric desert and xeric shrublands
50. Kunlun National Park	86. Eastern Hemispheric desert and xeric shrublands
51. Kunlun Shan	87. Eastern Himalayan Broadleaf and针叶林 (coniferous) forests
52. Kunlun Shan	88. Greater Sundas mangroves
53. Kunlun Shan	89. Hengduan Shans, canyons, rivers & lakes
54. Kunlun Shan	90. Huanghe River wetlands
55. Mount Wuyi	91. Huanghe River wetlands
56. Mount Daisen-Nishizawa	92. Huanghe River wetlands
57. Mount Heng (Wutai)	93. Huanghe River wetlands
58. Mount Heng (Wutai)	94. Huanghe River wetlands
59. Mount Heng (Wutai)	95. Taimu and Russian coastal forest
60. Mount Heng (Wutai)	96. Taimu and Russian coastal forest
61. Mount Heng (Wutai)	97. Taimu and Russian coastal forest
62. Mount Heng (Wutai)	98. Taimu and Russian coastal forest
63. Mount Heng (Wutai)	99. Taimu and Russian coastal forest
64. Mount Heng (Wutai)	100. Taimu and Russian coastal forest
65. The Yunnan-Guizhou Plateau	
66. The Yunnan-Guizhou Plateau	
67. Three Gorges Area	
68. Tianshan Road Marine Park	
69. Ulungur Kulu National Park and Kanas National	
70. Ural Bataik National Park	
71. Wulanhada National Park	
72. Xianggong-Shuanghe National Park	
73. Yaxi Lake	
74. Yunnan National Park	
75. Yunnan National Park	
76. Yunnan National Park	
77. Yunnan National Park	
78. Yunnan National Park	
79. Yunnan National Park	
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95. Yunnan National Park	
96. Yunnan National Park	
97. Yunnan National Park	
98. Yunnan National Park	
99. Yunnan National Park	
100. Yunnan National Park	

Geographic Projection

Compiled by M. Mason
Date printed May 2004
Source: Olson, D. M. and E. Dinerstein. The Global 200 Priority ecoregions for global conservation. (PDF file) Annals of the Missouri Botanical Garden
69(25-26): UNEP-WCMC
WDP-A v.6.1 Dataset.

Map 7

Distribution of World Heritage Sites & WWF Global 200 Ecoregions in Africa



WWF Global 200 Ecoregions

1. Agulhas Current
2. Albertine Rift Montane Forests
3. Arabian Highlands woodlands and shrublands
4. Arabian Sea
5. Benguela Current
6. Cameroonian Highlands forests
7. Cameroonian Greater Lake
8. Canary Current
9. Cape Rivers & Streams
10. Central Congo Basin moist forests
11. Central and Eastern Miombo woodlands
12. Congo Basin Piedmont Rivers & Streams
13. Congo River and Flooded forests
14. Congolian Coastal Forests
15. Drakensberg Montane Woodlands and Grasslands
16. East African Acacia Savannas
17. East African Mangroves
18. East African Marine
19. East African Moorlands
20. East African coastal forests
21. Eastern Arc Montane Forests
22. Ethiopian Highlands
23. Fynbos
24. Guinean Moist Forests
25. Guinean-Congolian Coast Mangroves
26. Gulf of Guinea Mangroves
27. Gulf of Guinea Rivers & Crate
28. Horn of Africa Acacia Savannas
29. Madagascar Dry Forests
30. Madagascar Forests and Shrublands
31. Madagascar Freshwater Ecosystem
32. Madagascar Mangroves
33. Madagascar Spiny Thicket
34. Mediterranean Sea
35. Namb-Karoo-Kaokoveld Deserts and Shrublands
36. Niger River Delta
37. Northeastern Congo Basin moist forests
38. Red Sea
39. Rift Valley Lakes
40. Senegal & Gambia River Mangroves & Wetlands
41. Seychelles and Mascarenes Moist Forests
42. Socotra Island Desert
43. Southern Rift Montane Woodlands
44. Sudanian savannas
45. Sudd-Sahelian flooded grasslands and savannas
46. Upper Guinea Rivers & Streams
47. West Madagascar Marine
48. Western Congo Basin moist forests
49. Zambezian Flooded Savannas

World Heritage Sites

1. Ar and Tchad Natural Reserves
2. Aldabra Atoll
3. Banc d'Arguin National Park
4. Bwindi Impenetrable National Park
5. Cliffs of Bandagari (Land of the Dogons)
6. Comoé National Park
7. Dja Faunal Reserve
8. Djoudj National Bird Sanctuary
9. Garamba National Park
10. Gough Island Wildlife Reserve
19. Mount Nimba Reserves
20. Ngorongoro Conservation Area
21. Niokolo - Koba National Park
22. Okapi Faunal Reserve
23. Okhahlamba - Drakensberg Park
11. Greater St Lucia Wetland Park
12. Ichkeul National Park
13. Kahuzi - Biéga National Park
14. Kilimanjaro National Park
15. Lake Malawi National Park
16. Lake Turkana National Parks
17. Manú Pools National Park, Sapi and Chewore Safari Areas
18. Mount Kenya National Park/Forest
24. Parc National de Manovo - Gounda - St Flans
25. Rwenzori Mountains National Park

26. Salonga National Park
 27. Selous Game Reserve
 28. Serengeti National Park
 29. Simen National Park
 30. Ta National Park
 31. Tassili N'Ajjer
 32. Tsingy de Bemaraha Strict Nature Reserve
 33. Vallée de Mai Nature Reserve
 34. Victoria Falls/Mosi-o-a-Tunya
 35. Virunga National Park
 36. W' National Park

Geographic Projection

Compiled by: M. Mason
 Revised by: L. Fish
 Date printed: May 2004

Source: Conservation International (2001).
 Biodiversity Hotspots. Conservation International:
 Washington, DC
 & UNEP-WCMC WDPA V.6.1 Dataset

Map 8

World Heritage Sites & WWF Global 200 Ecoregions in North America



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WWF Global 200 Ecoregions		Geographic Projection Compiled by: I.M. Mason Date printed: May 2004
World Heritage Sites		Source: Olson, D. M. and E. Dinerstein. 2002. Priority ecoregions for global conservation. (PDF) <i>Aurasia</i> 10(1): 1-25.
137. Taishenshini - Aisek/Kluane/ Wrangell - St Elias/Glacier Bay		Mission Biogeographic Grids v1.0. UNEP-WCMC WDPA v 6.0. Databases
122. Canadian Rocky Mountain Parks		30. Sierra Nevada Coniferous Forests
123. Carlsbad Caverns		31. Sonoran and Baja Deserts
124. Dinosuar Provincial Park		32. Southeastern Rivers & Streams
125. Everglades National Park		33. Southeastern conifer and broadleaf forests
126. Glacier and Waterton Lakes National Park		34. Southern Mexican Dry Forests
127. Grand Canyon National Park		35. Sierra Nevada Coastal Ranges
128. Great Smoky Mountains National Park		36. Gulf of Alaska Coastal Rivers
129. Gros Morne National Park		37. Hawaii dry forest
130. Hawaii Volcanoes National Park		38. Hawaii moist forest
131. Mammoth Cave National Park		39. Hawaiian Marine
132. Miyazaki Park		40. Klamath-Siskiyou coniferous forests
133. Nantahala National Park		41. Northern California Coast Ranges
134. Olympic National Park		42. Lower Mississippi River
135. Redwood National Park		43. Appalachian Pine-Oak Forests
136. San Kan		44. Mesocaribbean Reef
		45. Mississippi Piedmont Rivers & Floodplains
		46. Muskwa/Dilwa Lake Boreal Forests
		47. Northern Prairies
		48. Pacific Northwest Coastal Rv
		49. Pacific temperate rainforests
		50. Sierra Madre Oriental and Occidental Pine-Oak

Geographic Projection
Compiled by: M. Mason
Date printed: May 2004

Source: Olson, D. M. and E. Dierschke. The Global 200: Priority ecoregions for global conservation (PDF file) Annals of the Missouri Botanical Garden 89: 125-126 & JNMRG/NCM WDCA v 6 1 Dataset

Map 9

World Heritage Sites & WWF Global 200 Ecoregions in South America

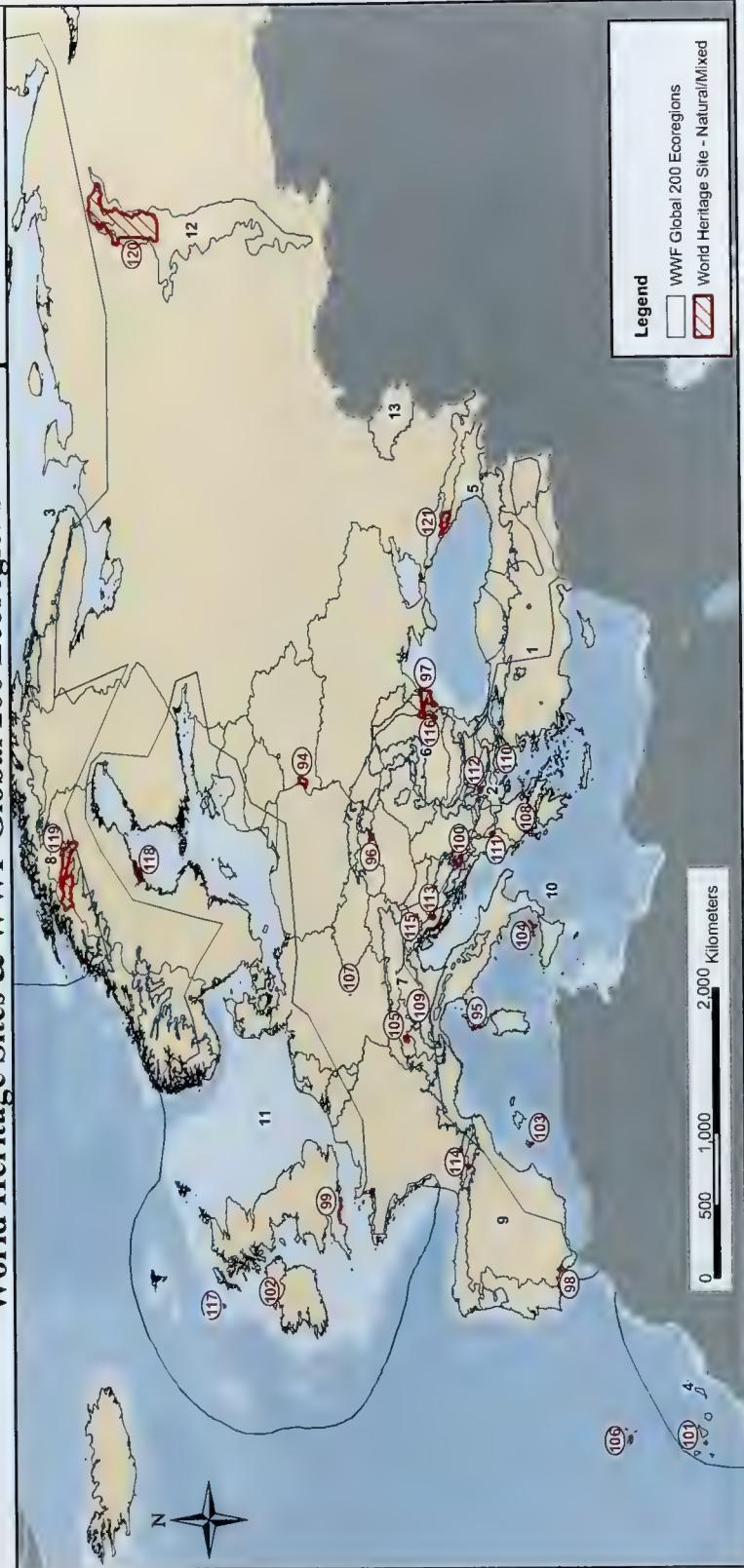


WWF Global 200 Ecoregions		World Heritage Sites	Geographic Projection
1 Amazon River and Flooded Forests	29 Napo Moist Forests	142 Alejandro de Humboldt National Park	Compiled by: M. Mason
2 Atacama-Sequira Deserts	30 Northeast Brazil Shelf Marine	143 Área de Conservación Guanacaste	Date printed: May 2004
3 Atlantic Dry Forests	31 Northern Andean Montane Forests	144 Belize Barrier Reef Reserve System	
4 Atlantic Forests	32 Northern Andean Páramo	145 Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves	
5 Brazilian Shield Amazonian Rainforest	33 Orinoco River & Flooded Forests	146 Canaima National Park	
6 Central American Mangroves	34 Orinoco-Amazon Mangroves & Coastal Swamps	147 Central Amazon Conservation Complex	
7 Central Andean Dry Puna	35 Panama Bight	148 Central Suriname Nature Reserve	
8 Central Andean Yungas	36 Panama Bright Mangroves	149 Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks	
9 Cerrado Woodlands and Savannas	37 Pantanal Flooded Savannas	150 Danum National Park	
10 Chilean Maternal	38 Patagonian Southwest Atlantic	152 Desembarco del Granma National Park	
11 Chiquitano Dry Forests	39 Patagonian Steppe	153 Discovery Coast Atlantic Forest Reserves	
12 Choc - Darién Moist Forests	40 Rapa Nui	154 Galapagos Islands	
13 Coastal Venezuela Montane Forests	41 Rio Negro-Juruá-Madre de Dios Moist Forests	155 Historic Sanctuary of Machu Picchu	
14 G200 mangroves	42 Southern Caribbean Sea	156 Huascarán National Park	
15 Galápagos Islands Scrub	43 Southern Mexican Dry Forests	157 Iguazu National Park	
16 Galápagos Marine	44 Southwest Amazonian Moist Forests	158 Iguaçu National Park	
17 Greater Antillean Freshwater	45 Talamancan-Isthmian Pacific Forests	159 Ischigualasto - Talampaya Natural Parks	
18 Greater Antillean Marine	46 Tumbesian-Andean Valleys Dry Forests	160 Los Glaciares	
19 Greater Antillean Moist Forests	47 Upper Amazon Rivers & Streams	161 Los Katos National Park	
20 Greater Antillean Pine Forests	48 Upper Paraná	162 Manu National Park	
21 Guayanen Highlands Moist Forests	49 Vaupés-Tambopata Temperate Rain Forests / Juan Fernández Islands	163 Morne Trois Pitons National Park	
22 Guayanen Freshwater		164 Noel Kempff Mercado National Park	
23 Guayanen Moist Forests		165 Pantanal Conservation Complex	
24 High Andean Lakes		166 Península Valdés	
25 Humboldt Current			
26 Llanos Savannas			
27 Mesoamerican Pine-Oak Forests			
28 Mesoamerican Reef			

Map 10

Source: Olson, D. M. and E. Dinerstein. The Global 200: Priority ecoregions for global conservation. (PDF file) Annals of the Missouri Botanical Garden 89:125-126 & UNEP-WCMC WDPA V 6.1 Dataset.

World Heritage Sites & WWF Global 200 Ecoregions in Europe



WWF Global 200 Ecoregions

1. Anatolian Freshwater
2. Balkan Rivers & Streams
3. Barents-Kara Seas
4. Canary Current
5. Caucasus-Anatolian-Hyrcanian temperate forests
6. Danube River Delta
7. European-Mediterranean mountain forests
8. Fenno-Scandinavian tundra and taiga
9. Fennoscandian Forests, Woodlands and Scrub
10. Mediterranean Sea
11. Northeast Atlantic: Shelf Marine
12. Ural mountains tundra and Taiga
13. Volga River Delta

Geographic Projection

Compiled by M. Mason
Date printed: May 2004

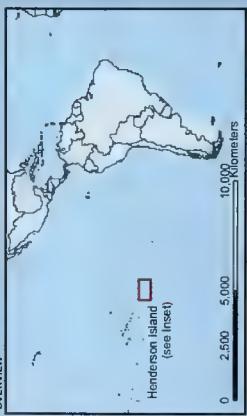
Source: Olson, D. M. and E. Dinerstein, The Global 200 Priority Ecoregions for global conservation (PDF file). Available at the Museum Biological Garden 89: 25-126 & UNEP-WCMC WDPA v 6.1 Database.

Map 11

World Heritage Sites & WWF Global 200 Ecoregions in Oceania/Australasia



OVERVIEW



World Heritage Sites

74. Australian Fossil Mammal Sites (Riversleigh / Naracoorte)
75. Central Eastern Australian Rainforest
76. East Rennell
77. Fraser Island
78. Great Barrier Reef
79. Heard and McDonald Islands
80. Henderson Island
81. Kakadu National Park
82. Lord Howe Island Group
83. Macquarie Island
84. New Zealand Sub-Antarctic Islands
85. Purnululu National Park
86. Shark Bay Western Australia
87. Tasmanian Wilderness
88. Te Wahipounamu - South West New Zealand
89. The Greater Blue Mountains Area
90. Tongariro National Park
91. Uluru - Kata Tjuta National Park
92. Wet Tropics of Queensland
93. Willandra Lakes Region

WWF Global 200 Ecoregions

1. Fiji Barrier Reef
2. Banda-Flores Seas
3. Bismarck-Solomon Seas
4. Central Australian Freshwater
5. Central Sulawesi Lakes
6. Eastern Australia Rivers & Streams
7. Great Barrier Reef
8. Kimberley Rivers & Streams
9. Lakes Kudubu & Semani
10. Lord Howe-Norfolk Islands Marine
11. New Caledonia Barrier Reef
12. New Caledonia Rivers & Streams
13. New Guinea Mangroves
14. New Guinea Rivers & Streams
15. New Zealand Marine
16. Southern Australia Rivers & Streams
17. Southwest Australia Rivers & Streams
18. Sundaland Rivers & Streams
19. West Australia Marine
20. Tahitian Marine

Plate Carree Projection

Compiled by: M. Mason
Date printed: May 2004
Source: Ono, M. and E. Dinerstein: The Global 200 Priority Ecoregions for Global Conservation (PDF file). Annals of the Missouri Botanical Garden 89:125-126 & UNEP-WCMC WDPA V 6.1 Dataset

Map 12

3. Global Habitat Analyses

3.1 Accuracy of the Analyses

It should be noted that due to issues of scale and resolution of the IUCN/SSC and GLCC systems that became apparent during the review and are explained below, some of the derived conclusions do not accurately reflect the known habitat status of some existing WH Sites. For example, the IUCN/SSC habitats analysis indicated that there were no kelp or macroalgae beds in any WH Site, whereas this is not the case. Wherever possible such conclusions derived from the analyses are qualified in the discussion. The GLCC system also contains substantial errors, such as indicating the presence of mangroves in the Rwenzori National Park in Uganda. This has resulted in limiting the application of the habitat analyses down to the site scale in most cases. However, overall, the upper levels of both analytical systems provide a good basis for understanding the relationship of global habitat patterns and the WH network.

3.2 World Heritage Site Sheets Analysis

This analysis used the most recent revision (version 2.1) of the IUCN/Species Survival Commission (SSC) habitat classification scheme, which is under development primarily as a standard tool for characterising habitat preferences and habitat occupancy of species on the IUCN Red List. This is a three-level hierarchical scheme. The first level consists of 15 broad habitat categories, such as Forest and Wetland (inland). Four of these habitats (Rocky Areas, Introduced Vegetation, Other and Unknown) have no subdivisions, but the other eleven are subdivided into 78 second-level habitat types. These are further subdivided into 154 third-level categories. For example the first-level Habitat Type 2 Savannah consists of two subtypes: 2.1 Dry and 2.2 Moist. Habitat Type 2.1 Dry is further subdivided into 2.1.1 Savannah (Woods) and 2.1.2 Woody Savannah. The third-level habitat types are based on the Global Ecosystem Framework developed by Olson for the Global Land Cover Characterization (GLCC) data set in 1994. The main modification to the system is the inclusion of additional aquatic habitats (marine, inland and artificial) based on the wetland classification system used by the Ramsar Convention. The full IUCN/SSC habitat classification scheme is outlined in Annex 4.

The IUCN/SSC habitat scheme was used in combination with the World Heritage Site Sheets held on the World Database on Protected Areas (WDPA) at UNEP-WCMC. These data sheets consist of written descriptions of WH properties presented in a standard format. Sections cover:

- site name
- IUCN management category
- biogeographical province
- geographical location
- date and history of establishment
- area and land tenure
- altitude and physical features
- climate
- vegetation
- fauna
- cultural heritage
- local human population
- visitors and visitor facilities

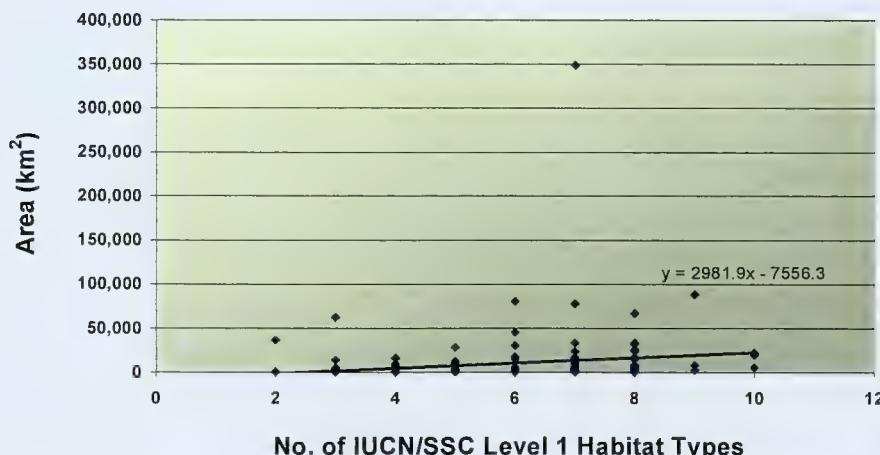
- scientific research and facilities
- conservation value
- conservation management
- management constraints
- staff and budget
- local addresses and references.

Each site description was reviewed and the first two levels of IUCN/SSC habitat classes present in each World Heritage Site were determined. It was decided that the level of detail in the vegetation sections of the Site Sheets was insufficient to permit classification to the third level of the IUCN/SSC scheme. Each habitat present was then assigned one of four qualitative abundance categories. In descending order these were D for dominant, I for important, P for present and M for minor. This was of necessity a subjective judgement, and therefore no quantitative parameters were set for each category. The main emphasis in the assignment of categories was on the unique nature of the site for which it was primarily included on the World Heritage list. This took precedence over area.

3.2.1 IUCN/SSC First-level Habitat Types

All of the 172 Natural and Mixed WH sites encompassed more than one IUCN/SSC first-level habitat type (range 2-10; average 5.62 per site). The number of different habitats was weakly correlated with the size of the WH Site, i.e. larger sites possessed a greater diversity of first-level habitat types (Figure 2). The only noticeable regional variation was that Oceanian/Australasian sites seemed to cover a greater diversity of habitat types than those in other continents, averaging 6.7 first-level habitats per site. This might merely reflect a greater level of information available for this region, which is dominated by the large number of sites in Australia and New Zealand, or the fact that they are of larger area on average (see Table 12).

Figure 2: Effect of World Heritage Site Area on number of First-Level IUCN/SSC Habitat Types



Note: Outlying point is Great Barrier Reef WH Site, 345,400 km²

Table 12: First-Level IUCN/SSC Habitat Types present in World Heritage Sites

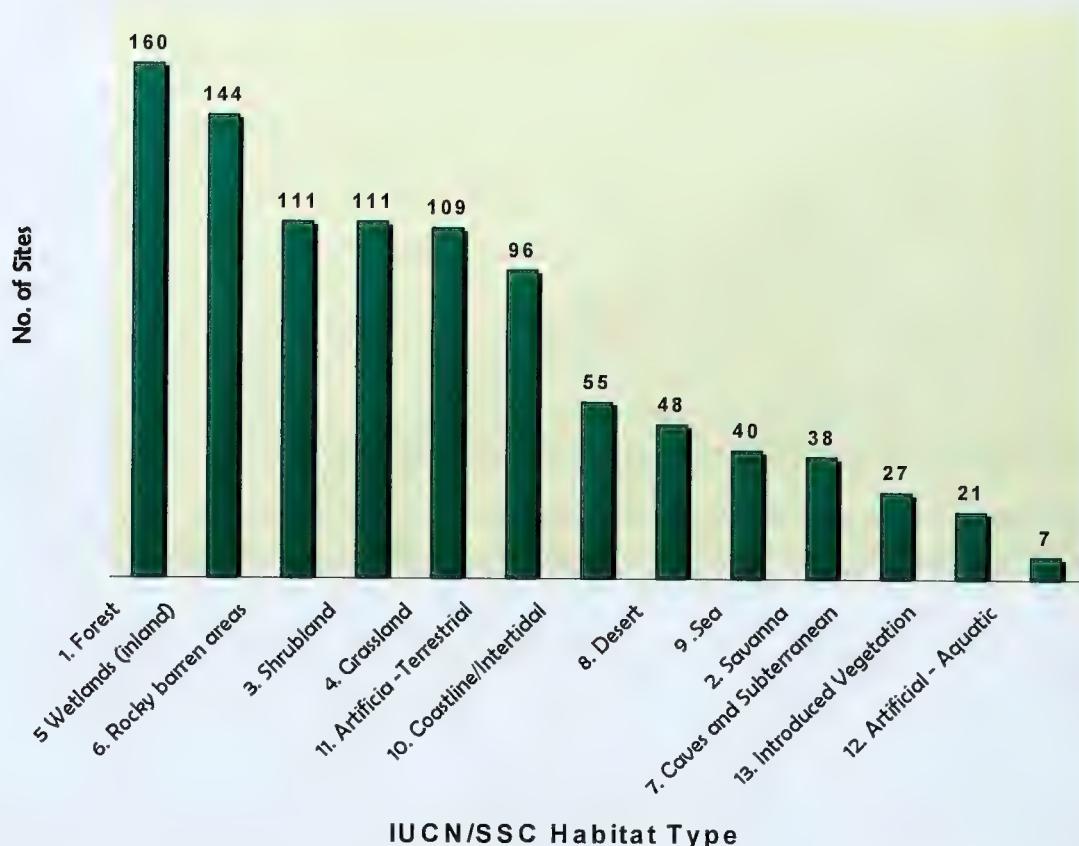
First-level IUCN/SSC Habitat Type	Africa (36 sites)	Asia (37 sites)	Oceania/ Australasia (20 sites)	Europe (28 sites)	North America (20 sites)	South America (31 sites)	Total (172 sites)
1. Forest	34	35	18	24	20	29	160
2. Savannah	18	5	3	0	1	11	38
3. Shrubland	27	19	17	20	14	14	111
4. Grassland	21	25	15	18	15	15	109
5. Wetlands (inland)	33	31	15	20	16	29	144
6. Rocky barren areas	19	25	16	18	15	18	111
7. Caves & Subterranean	1	9	4	9	2	2	27
8. Desert	9	12	9	6	9	3	48
9. Sea	4	8	9	6	4	9	40
10. Coastline/Intertidal	4	8	14	10	8	11	55
11. Artificial-Terrestrial	18	20	7	18	8	25	96
12. Artificial-Aquatic	1	2	1	3	0	0	7
13. Introduced Vegetation	3	2	6	2	4	4	21
Total no. of habitat types	192	201	134	154	116	170	967
Average size of WH site (km²)	11,110	6,743	23,874	2,324	11,107	9,644	9,960

Globally, the most commonly represented first level habitat type is forest, present in 160 out of 172 WH Sites (93%), whilst the two least commonly represented habitats are artificial aquatic habitats and introduced vegetation (present in 4% and 12% of sites respectively, see Figure 3). Sea and coastline/intertidal habitats are not well represented in this analysis, occurring in only 40 (23%) and 55 (32%) WH sites respectively.

The key points from Table 12 are:

- Forests commonly occur in WH sites on all continents.
- Within Africa, coastal and maritime/caves and subterranean habitats are uncommon. One out of 36 African WH sites (3%) includes subterranean habitats - possibly because ancient crystalline rocks cover so much of Africa - while four (11%) include coastal and marine habitats.
- Three out of 20 sites in Oceania/Australasia (15%) include savannah.
- No European site includes savannah habitat. Although not prevalent, there are some savannah areas, such as the wooded savannahs of the montado sylvo-agricultural system of holm and cork oak production in Portugal and Spain, that are important reservoirs of European biodiversity.
- In North America savannah habitats are uncommon, occurring in only one out of 20 WH sites (5%).
- Only three out of 31 South American WH sites (10%) include desert.

Figure 3: First-Level IUCN/SSC Habitat Types present in World Heritage Sites



3.2.2 IUCN/SSC Second-level Habitat Types

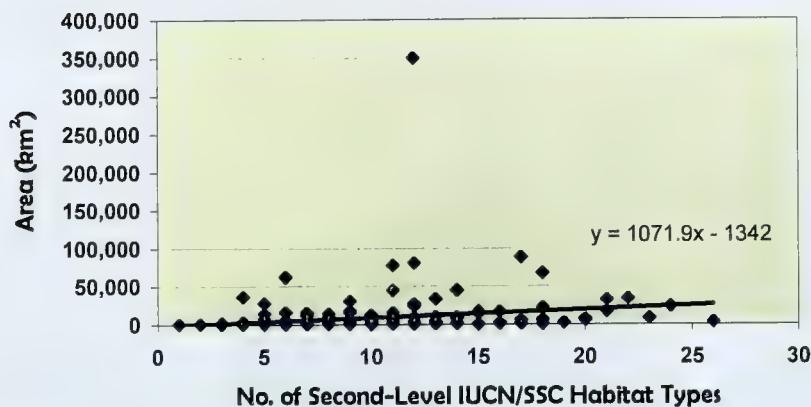
The presence of second-level IUCN/SSC habitat types was also examined. All WH Sites encompassed more than one second-level IUCN/SSC habitat type. Over the 172 WH Sites, a total of 1,720 habitats were categorized, an average of 10 second-level habitat types per site (range 1–26). There was a weak correlation between size and number of habitat types. In general larger sites possessed a greater diversity of habitat types (Figure 4).

Preliminary examination of the data also suggested that sites in the tropics and those with a greater altitudinal range possessed a greater diversity of habitat types. These effects of area, latitude and altitude on diversity of habitat types were, however, often confounded by two independent variables:

1. The level of detail of the habitat/vegetation information available for the site, which varied from sparse (e.g. Phong Nha–Ke Bang National Park in Vietnam) to comprehensive (e.g. Waterton Glacier International Peace Park);
2. The presence of wetlands and human modified aquatic habitats. The IUCN/SSC second-level habitat categories use the Ramsar wetland categories, which are highly subdivided. Thus there are twice as many categorizations for inland wetlands (18) as forest (9), and as many artificial aquatic habitat categories (10) as savannah (2) and shrubland (8) combined.

Figure 4: Effect of World Heritage Site Area on number of Second-Level IUCN/SSC Habitat Types

Note: Outlying point is Great Barrier Reef WH Site, 345,400 km²



The frequency of occurrence of second-level IUCN/SSC habitat types in World Heritage Sites is shown in Table 13 and Figure 5, grouped by first level habitat type. Figure 6 shows the relative frequency of occurrence expressed as a percentage. It should be noted that any scoring of a second-level habitat category automatically indicates that the site includes the corresponding first-level habitat; and also that sites can include more than one second-level habitat category for each first-level habitat. Thus a site such as Lorentz National Park in Indonesia ranging from sea-level to alpine regions in the tropics encompasses five second-level forest types, varying from Subtropical/Tropical Mangrove to Temperate Forest.

Globally, the most common second-level habitat type present in World Heritage Sites is inland wetlands (463 habitats), followed by forest (315) and artificial-terrestrial habitats (165). The predominance of wetland habitats is perhaps not surprising given the ubiquity of freshwater on the planet, but is also probably in part due to the large number of second-level wetland categories (18) because of the adoption of the detailed Ramsar wetland classification system. Under this system even desert ecosystems have wetlands in the form of temporary watercourses and oases. Savannah has a surprisingly low occurrence (43), being present even less frequently than desert (53) and sea (80) habitats.

On a continental basis, the main points from Table 13 are:

- Asia, Africa and South America have almost twice the coverage of forest habitats as Europe, North America and Oceania.
- Savannah habitats are absent or almost absent from four of the six continents, but are frequent in Africa and South America.
- Caves and subterranean habitats occur less frequently in Africa, North America and South America compared with Asia, Oceania/Australasia and Europe.
- African WH Sites have very few coastline/intertidal habitats compared to the other continents.

These findings reinforce the analysis based on first-level habitats.

Table 13: Count of Second-Level IUCN/SSC Habitat Types present in World Heritage Sites, grouped by First-Level Habitat Type and Continent/Region

IUCN/SSC First-Level Habitat Type	Africa	Asia	Oceania/ Australasia	Europe	North America	South America	Total
1. Forest	69	71	39	29	39	68	315
2. Savannah	22	5	3		1	12	43
3. Shrubland	38	27	22	23	22	16	148
4. Grassland	33	43	18	18	20	20	152
5. Wetlands (inland)	107	105	39	76	62	74	463
6. Rocky barren areas	20	25	16	18	16	18	113
7. Caves and subterranean	1	9	4	9	2	2	27
8. Desert	9	13	10	6	12	3	53
9. Sea	13	15	17	10	7	18	80
10. Coastline/intertidal	12	19	25	17	24	34	131
11. Artificial-terrestrial	31	42	9	34	10	39	165
12. Artificial-aquatic	1	3	1	4			9
13. Introduced vegetation	3	2	6	2	4	4	21
Total	359	379	209	246	219	308	1,720

Figure 5: Occurrence of IUCN/SSC Second-Level Habitat Types in World Heritage Sites, grouped by First-Level Habitat Type

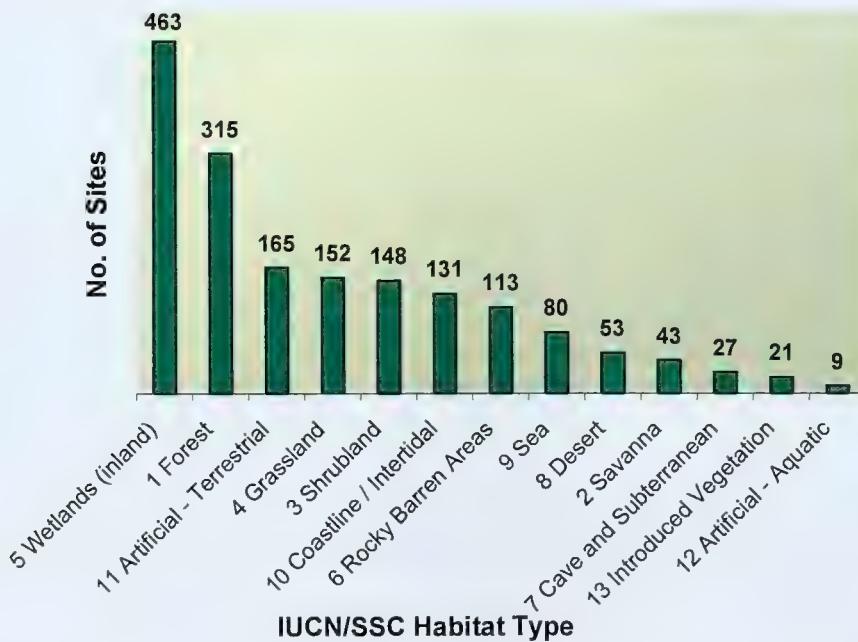
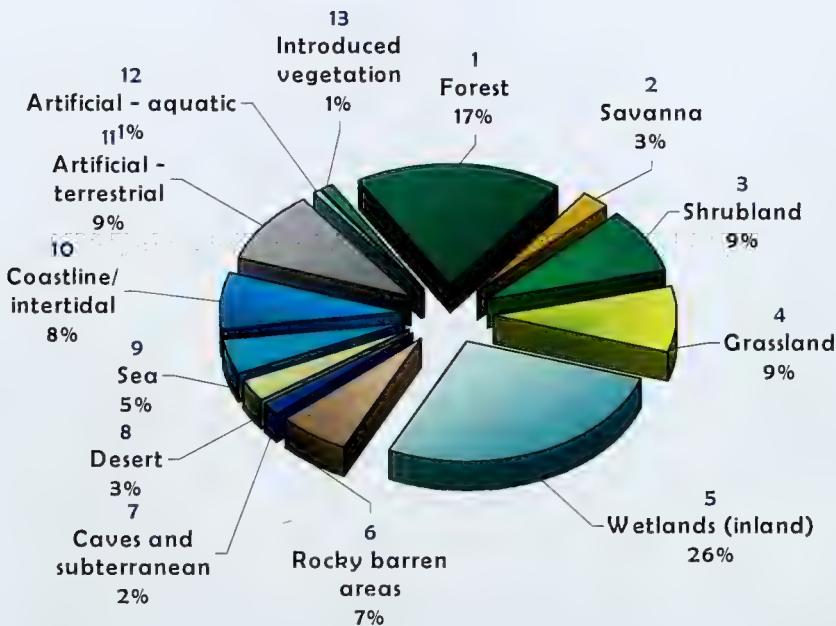


Figure 6: Relative Frequency (%) of IUCN/SSC Second-Level Habitat Types in World Heritage Sites, grouped by First-Level Habitat Type



The full breakdown of second-level habitat types present in WH Sites is given in Table A4-2, grouped by continent, and the 20 most commonly occurring second-level habitat types are shown in Figure 7.

Key points:

- Although 76 WH sites (44%) include subtropical/tropical moist forest, the analysis indicates that only one site (PN Los Glaciares) contains Sub-Antarctic forest. However, site information held by UNEP-WCMC indicates that the New Zealand Sub-Antarctic Islands WH Site includes forest habitat.
- Seven sites contain Sub-Arctic forest.
- Of the 148 sites containing shrubland, one site (New Zealand Sub-Antarctic Islands) includes Sub-Antarctic shrubland, whereas five sites possess subarctic shrubland.
- Subpolar grasslands are uncommon (only 6 sites include subarctic grassland and only 3 subantarctic).
- There are relatively few (a total of 14) permanent or seasonal/intermittent saline, brackish or alkaline wetland habitats.
- Rocky barren areas are common: 113 sites (66%) include this habitat.
- There are 27 cave and subterranean habitats.

- More sites include cold desert (e.g. high plateaux and ice) than hot and temperate desert combined: 28 versus 25 sites.
- The analysis indicates that there are no kelp or macroalgae beds currently in WH Sites. However, this habitat does occur in at least two sites: Australia's Heard and MacDonald Islands WH Site, and Macquarie Island WH Site.
- Three sites include coastal freshwater lagoons, compared to 17 that include coastal brackish/saline lagoons.
- Many sites include substantial areas of human-modified habitats: 35 sites (20%) include arable land and 46 (27%) include pasture land.
- Introduced vegetation figures in 21 (12%) sites.
- 'Other' and 'Unknown' habitat types were not categorized in this analysis.

3.2.3 Dominant Habitats

Thus far, the analysis has looked at *all* habitats present in each World Heritage site, giving equal weight to each. For example, a single oasis in a large desert site has equal importance as the predominant hot desert that comprises the vast majority of the site. This masks the true picture of habitat coverage, as many habitats in each site will only be present in small quantities. Many sites have been nominated for a certain set of attributes: for example a particular landscape or ecosystem that dominates the site. A greater understanding of the global coverage of habitat by WH Sites can therefore be gathered from restricting the analysis to those habitats that were categorised as dominant within each site (see Table A4-1). Of the 1,720 second-level habitats categorized in World Heritage Sites, 211 were scored as dominant, 118 as important, 1,247 as present and 144 as minor (see Table 14).

Table 14: Dominant First-Level IUCN/SSC Habitat Types in World Heritage Sites

First-level IUCN/SSC habitat type	Africa	Asia	Oceania/ Australasia	Europe	North America	South America	Total
1. Forest	14	21	9	7	6	18	75
2. Savannah	8	1				2	11
3. Shrubland	1						1
4. Grassland	3	2				2	7
5. Wetlands (inland)	8	6	2	7	3	5	31
6. Rocky barren areas	4	9	5	8	8	4	38
7. Caves and subterranean	2		1	3	2		8
8. Desert	3	3	1	1	4	1	13
9. Sea	2	2	3	1		4	12
10. Coastline/intertidal	2	1	2	3	3	1	12
11. Artificial – terrestrial	1			2			3
Total	45	48	23	32	26	37	211

Note: Some sites (e.g. Waterton Glacier International Peace Park) were considered to have two or more dominant habitat types, so total number of sites appears inflated from 172 to 211).

Figure 8 shows the overall global percentages of dominant first-level IUCN/SSC habitats in WH Sites.

Artificial aquatic habitats and introduced vegetation were not the dominant habitats in any WH Sites. However, there were three sites in which artificial terrestrial habitats were considered dominant, namely: Mount Athos in Greece, the Aeolian Islands in Italy and Göreme National Park and the Rock Sites of Cappadocia in Turkey. Main points to note are:

- Two habitat types, forest and rocky barren areas, account for 54% of the dominant habitats in WH Sites.
- Shrubland is dominant in only a single site: Rwenzori National Park in Uganda, in which tropical high altitude shrubland and cold desert were co-dominant habitats.
- Grassland (3%), coastline/intertidal (6%), savannah (5%), desert (6%) and sea (6%) are all uncommon.

The analysis of dominant habitat types is extended to the second-level of IUCN/SSC habitat types below (Table 15 and Figure 9).

Figure 7: The 20 most commonly occurring Second-Level IUCN/SSC Habitat Types in World Heritage Sites

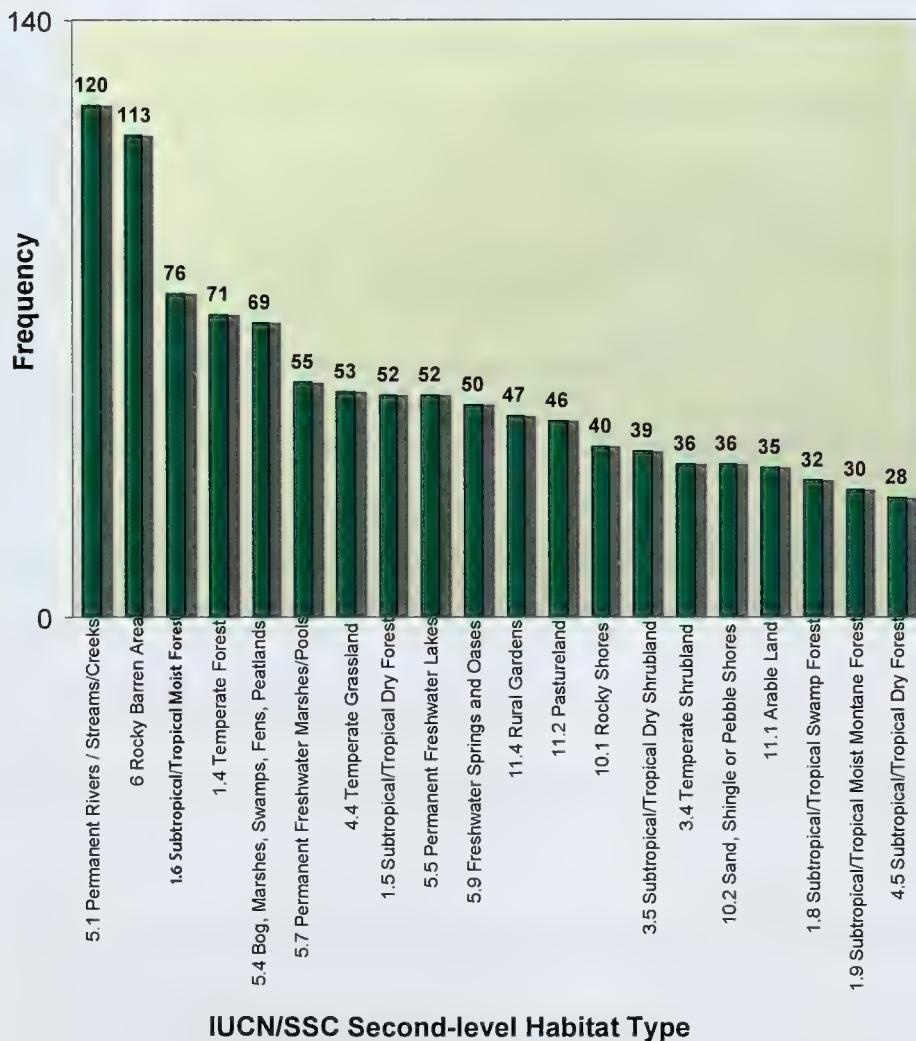


Figure 8: Dominant IUCN/SSC First-Level Habitat Types in World Heritage Sites

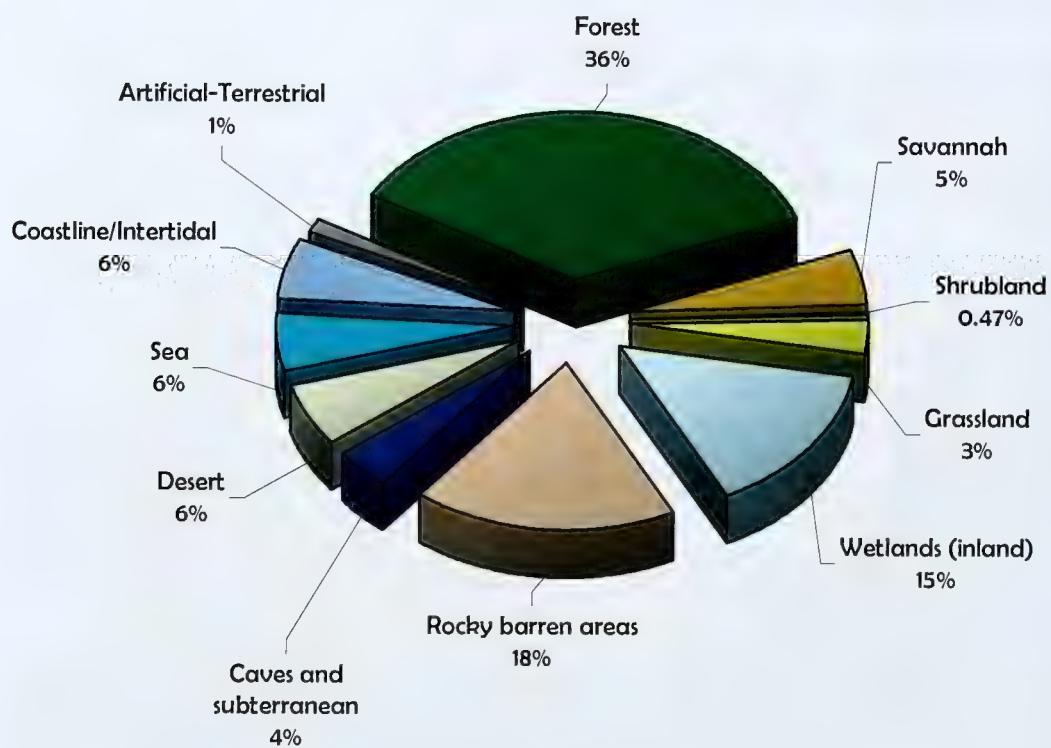


Table 15: Dominant Second-Level IUCN/SSC Habitat Types in World Heritage Sites

Second-Level IUCN/SSC Habitat Type	Africa	Asia	Oceania/ Australasia	Europe	North America	South America	Total
1.1 Boreal Forest		1		1	2		4
1.2 Subarctic Forest				1			1
1.3 Subantarctic Forest							0
1.4 Temperate Forest	9	4		5	4		22
1.5 Subtropical/Tropical Dry Forest	3		1			2	6
1.6 Subtropical/Tropical Moist Forest	9	6	4			11	30
1.7 Subtropical/Tropical Mangrove Forest		3					3
1.8 Subtropical/Tropical Swamp Forest	1	2				3	6
1.9 Subtropical/Tropical Moist Montane Forest	1					2	3
Forest Subtotal	14	21	9	7	6	18	75
2.1 Dry Savannah	5	1				1	7
2.2 Moist Savannah	3					1	4
Savannah Subtotal	8	1	0	0	0	2	11
3.7 Subtropical/Tropical High Altitude Shrubland	1						1
Shrubland Subtotal	1	0	0	0	0	0	1
4.4 Temperate Grassland	2	1					1
4.6 Subtropical/Tropical Seasonally Wet/Flooded Grassland		1				1	2
4.7 Subtropical/Tropical High Altitude Grassland	1						1
Grassland Subtotal	3	2	0	0	0	2	7
5.1 Permanent Rivers/Streams/Creeks	1	2					3
5.4 Bog, Marshes, Swamps, Fens, Peatlands	2	1		2	2	1	8
5.5 Permanent Freshwater Lakes	5		1	4			10
5.6 Seasonal/Intermittent Freshwater Lakes				1			1
5.7 Permanent Freshwater Marshes/Pools		1					1
5.12 Geothermal Wetlands			1		1	1	3
5.14 Permanent Saline, Brackish or Alkaline Lakes		1					1
5.18 Karst & Other Subterranean Hydrological Systems		1					1
Inland Wetlands Subtotal	8	6	2	7	3	5	31
6 Rocky Barren Areas	4	9	5	8	8	4	38
Rocky Barren Areas Subtotal	4	9	5	8	8	4	38
7.1 Caves	1	1			1		3
7.2 Subterranean Habitats	1			3	1		5
Caves and Subterranean Subtotal	0	2	1	3	2	0	8
8.1 Hot Desert	2	1					3
8.3 Cold Desert	1	2	1	1	4	1	10
Desert Subtotal	3	3	1	1	4	1	13
9.1 Open Sea		1				1	2
9.2 Shallow						1	1
9.3 Seagrass Beds	1		1	1			3
9.4 Coral Reefs	1	1	2			2	6
Sea Subtotal	2	2	3	1	0	4	12
10.1 Rocky Shores	1	1	2	3	2	1	10
10.4 Intertidal Mud, Sand or Salt Flats	1						1
10.6 Coastal Brackish/Saline Lagoons					1		1
Coastline/Intertidal Subtotal	2	1	2	3	3	1	12
11.5 Urban Areas		1		2			3
Artificial-Terrestrial Subtotal	0	1	0	2	0	0	3
Total	45	48	23	32	26	37	211

Note: Some sites (e.g. Waterton Glacier International Peace Park) were considered to have two or more dominant habitats, so total number of sites appears inflated from 172 to 211. Shaded cells indicate that habitat type does not occur on that continent.

The main points to note from Table 15 and Figure 9 on a global scale are:

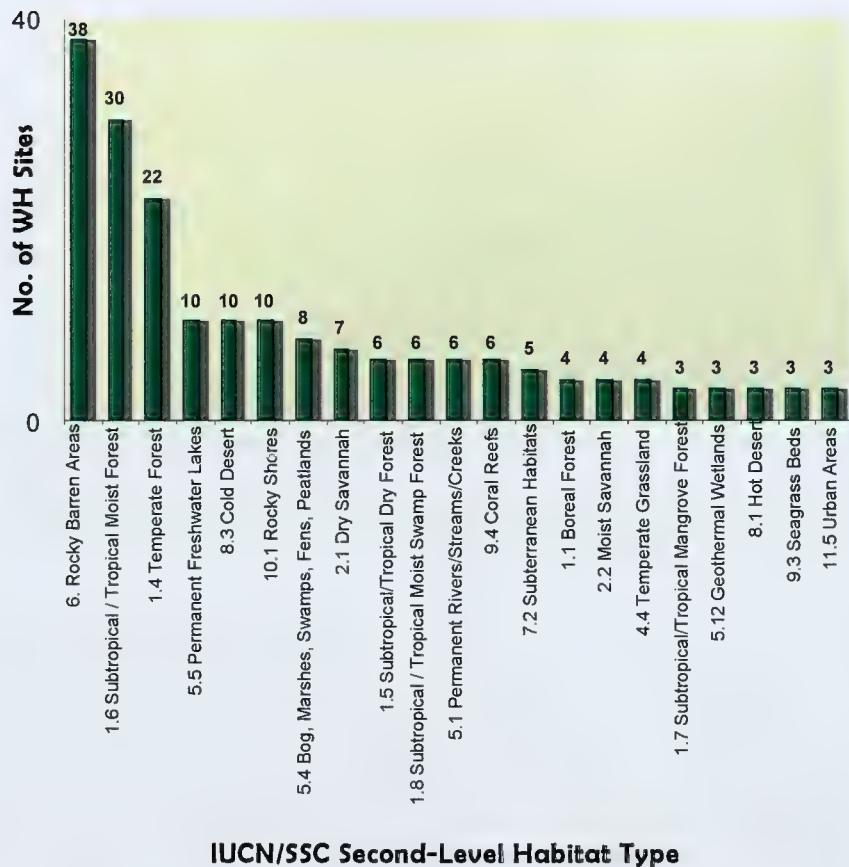
- Overall, the most common dominant second-level habitat type in WH Sites is rocky barren areas (38 sites), reflecting the fact that many sites include mountainous regions – and that the first-level habitat type has no sub-categories.
- Forest habitat types are common. Eight out of nine second-level forest habitat types are dominant in at least one WH Site, the exception being Sub-Antarctic forest which is not dominant in any site.
- In contrast, shrubland is very poorly represented. Subtropical/tropical high altitude shrubland is a dominant habitat in one site, but the remaining seven shrubland types are not dominant in any site.
- Over half (four out of seven) of all grassland types are not dominant in any site: tundra grassland, Sub-Arctic and Sub-Antarctic grassland and subtropical/tropical dry grassland.
- Eight out of 18 wetland habitats dominate in at least one site. The habitats that are not dominant in any WH site include seasonal watercourses and wetlands and smaller pools and oases. This is not surprising given that by their very description they are small in size and the fact that most WH Sites are large, on average covering 9,960 km².
- More than three times as many WH Sites have cold desert as the dominant habitat (10 sites) as hot deserts (three sites), and temperate desert is not dominant in any site.
- Among sea habitats, kelp/macroalgae is not a dominant habitat, and coral reefs are the dominant habitat in only six sites.
- Five out of eight coastal/intertidal habitats are not dominant at any site, namely: sand, shingle or pebble shores, estuarine waters, intertidal marshes, coastal freshwater lagoons and karst and other subterranean hydrological systems.

Further examining the trends by continent:

- Sub-Arctic forest is dominant in one European WH Site, but not in any North American or Asian sites.
- Temperate forest is dominant in 22 sites in Asia, Oceania/Australasia, Europe and North America, but is not dominant in any WH sites in Africa or South America.
- Subtropical/tropical dry forest is not dominant in any sites in Asia.
- Sub-tropical/tropical moist forest is not dominant in any sites in North America
- Although mangroves are dominant in three Asian sites, they are not dominant at any sites in South America, Oceania/Australasia or Africa.
- Subtropical/tropical swamp forest is not dominant in any sites in Australasia and North America.
- Subtropical/tropical moist montane forest is not dominant in any sites in Asia, Oceania/Australasia or North America.
- Half the continents/regions (Oceania/Australasia, Europe and North America) have no sites with grassland as the dominant habitat.
- Caves and subterranean systems are not dominant in any sites in Africa and South America.
- All continents except Asia have no sites in which permanent saline, brackish or alkaline lakes are the dominant habitat.
- Oceania/Australasia, North and South America have no sites dominated by hot desert.
- On the basis of this analysis, marine and coastal habitats have a low occurrence in all continents / regions. However, this is contradicted in Oceania/Australasia where 11 of the 20 WH Sites (including Hendersen Island, UK) have major coastal and/or marine components.

For example, Australia alone has seven sites - most notable being the Great Barrier Reef Marine Park. North America has no sites in which coral reefs are dominant, whilst Asia, North and South America have no sites in which seagrass beds are the dominant habitat type.

Figure 9: The 20 most common Dominant IUCN/SSC Second-Level Habitat Types in World Heritage Sites



3.3 GIS Analysis

The most reliable data set available for the GIS analysis of habitat cover was that provided by Version 2.0 of the GLCC freeware global habitat classification. This is a series of global land cover classification datasets, based primarily on the unsupervised classification of 1-km AVHRR (Advanced Very High Resolution Radiometer) 10-day NDVI (Normalized Difference Vegetation Index) composites. The source imagery is unfortunately approximately 10 years old, and there have also been some problems with the classification - for example some small islands are missing from the data set.

A more recent product was considered for use in this study, the outputs from the Global Land Cover 2000 Project, which gives similar resolution coverage taken from SPOT imagery, but based on images from the year 2000. Although these data were available there were a number of problems. Firstly there are spatial gaps (notably in Siberia and the Pacific islands). Secondly it was very difficult to convert the GLC non-forest classes into classes that fitted with more commonly understood habitats (grasslands, savannah, desert etc). It would have been both time-consuming and costly to resolve these problems and therefore it was not possible to address them in this study.

The available polygon data (delimited geographical boundaries) for all 172 Natural and Mixed World Heritage Sites were obtained from the World Database on Protected Areas maintained by UNEP-WCMC and entered into a GIS layer. The GLCC data were entered as a separate layer. This classification, developed by Olson (1994a, 1994b), uses 94 ecosystem classes , and operates at a fairly coarse resolution of 1 km². The ecosystem classes are based on their land cover mosaic, floristic properties, climate, and physiognomy. The objective of the resulting Global Ecosystem framework is to provide a mechanism for tailoring data to the unique landscape conditions of each continent, while still providing a means for summarising the data at the global level².

Many of these habitat classes were excluded from this analysis because they simply were not present in the GIS dataset used. Examples of habitats excluded are 49 Volcanic Rock and 88 Bamboo. Out of the 74 habitat types in the GIS coverage used, 72 were present in the WH Sites. Those habitats that were missing from WH Sites but present in the global coverage were 7 Tall Grasses and Shrubs and 76 Crop and Water Mixtures. A complete description of these habitat types and further background information on GLCC are given in Annex 3 and Table A3. Only 74 of these habitat types were present in the GIS dataset used in this analysis, and only 72 occurred in WH Sites. The Olson-GLCC habitat descriptions were converted to the nearest equivalent in the IUCN/SSC system using the scheme described in Annex 3.

The two GIS layers were then overlaid in an ARCINFO GIS system and areas of habitat in each WHS were calculated. A comparison was then conducted with the total global area of each type of habitat, to determine the extent of habitat occurrence in WH Sites.

3.3.1 Distribution of World Heritage Sites

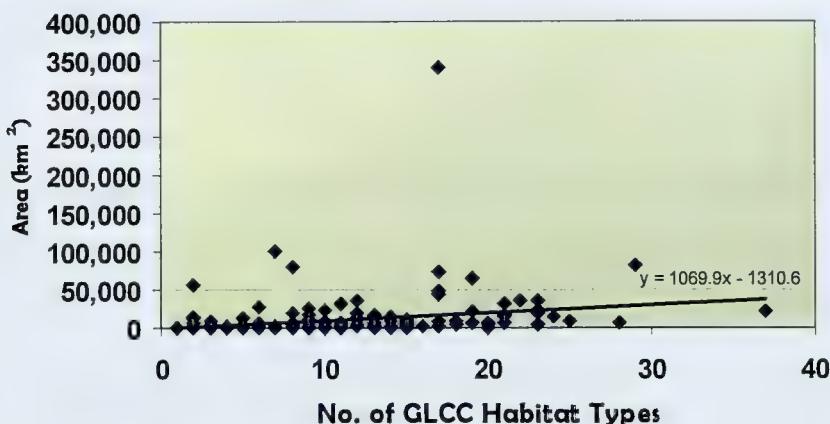
The distribution of the 172 Natural and Mixed World Heritage Sites in relation to first-level IUCN/SSC habitat types is shown on a continental basis on Maps 7-12xx. The only habitat that could be further subdivided using the GLCC dataset was Forest. For this analysis this first-level habitat type was broken down into four sub-categories by UNEP-WCMC: Temperate and Boreal Needleleaf; Temperate Broadleaf and Mixed; Tropical Moist and Tropical Dry.

² Source: Land Processes Distributed Active Archive Center: http://edcdaac.usgs.gov/glcc/globdoc1_2.asp

3.3.2 Size of Site and Number of Habitats

The total area of Natural and Mixed World Heritage Sites is 1,713,188.34 km² according to the polygon data stored on the UNEP-WCMC GIS database. The GLCC coverage calculated 1,823 habitat areas for the 172 sites, giving an average of 10.6 habitat types per WH Site (range 1, for example Messel Pit Fossil Site, to 39 in the Three Parallel Rivers of Yunnan Protected Areas). Once again, there was a weak correlation between site size and number of habitat types. In general larger sites possessed a greater diversity of habitat types (Figure 10).

Figure 10: Relationship between World Heritage Site Area and Number of GLCC Habitat Types



3.3.3 IUCN/SSC First-level Habitat Types

All the GLCC habitat types used in this analysis could be allocated to IUCN/SSC first level habitat categories. A full breakdown of the habitats covered by World Heritage sites in each continent is given in Table 16. In the GLCC dataset, land cover data are missing for the many small island systems. Eleven of these are WH Sites: Henderson Island, Heard and McDonald Islands, Macquarie Island, Cocos Island National Park, New Zealand Sub-Antarctic Islands, Hawaii Volcanoes National Park, Galapagos Islands, Aldabra Atoll, Brazilian Atlantic Islands, Gough Island and Vallée de Mai Nature Reserve (in the Seychelles). The land area of these sites totals 10,273 km², equivalent to 12.83% of the missing data in the GLCC dataset (Table 16 and Figure 11). The sites are still included in the analysis because all except the Vallée de Mai have a marine component, and the total sea area of these 10 sites, at 76,560 km², forms a substantial proportion (16.44%) of all the sea in WH Sites.

There are clearly some major shortcomings in the GLCC/Olson dataset. As an example, the GLCC indicates that only 122,745 km² of the world is categorized as Sand Desert while 16,210,069 km² is classed as Bare Desert. However, the true total of sand desert is in the order of millions of square kilometres. In fact, only 106 km² of Africa is classed as sand desert – the GLCC system is indicating that there is no sand in the Sahara! Other examples of discrepancies include most of the Korean Peninsula, Hokkaido and the forest in the Primor'e region of Russia being classed as savannah, and Antarctica supposedly containing 45 km² of wooded wet swamps. For this reason it was decided to limit the GIS analysis to a broad-brush approach, as it was not within the remit of

this study to fully investigate the limitations of the GLCC dataset. However, despite the shortcomings, it is considered that on a continental basis discrepancies will not be too large.

Table 16: Area (km²) of each IUCN/SSC First-Level Habitat Type in World Heritage Sites, grouped by Continent/Region

IUCN/SSC First-level Habitat Type*	Africa	Asia	Oceania/Australasia	Europe	North America	South America	Total
1. Forest	75,709	92,261	34,617	38,443	98,122	135,084	474,236
2. Savannah	75,049	9,565	32,551	249	96	21,617	139,127
3. Shrubland	2,343	4,045	2,576	2,230	4,348	11,114	26,654
4. Grassland	7,349	39,968	14,370	5,663	40,802	12,192	120,345
5. Wetlands (inland)	3,272	40,484	2,272	2,643	3,808	7,985	60,465
8. Desert	185,614	41,845	6,057	4,680	65,702	6,514	310,413
9. Sea	7,869	5,724	382,310	2,644	5,647	61,477	465,669
11. Artificial-Terrestrial	42,670	11,015	1,408	8,525	2,697	34,782	101,096
12. Artificial-Aquatic		4,577	7	14	201	43	4,841
13. Missing data	98		1,315		716	8,145	10,273
Total	399,971	249,483	477,483	65,090	222,138	298,952	1,713,118

*Some IUCN first-level habitat classes do not exist under GLCC, namely: 6. Rocky Barren Areas [e.g., inland cliffs and mountain peaks]; 7. Caves and Subterranean (because they are underground and GLCC deals only with the surface of the globe); 10. Coastline/Intertidal (since all these habitats are included by GLCC as Sea); 13. Introduced Vegetation; and 14. Other.

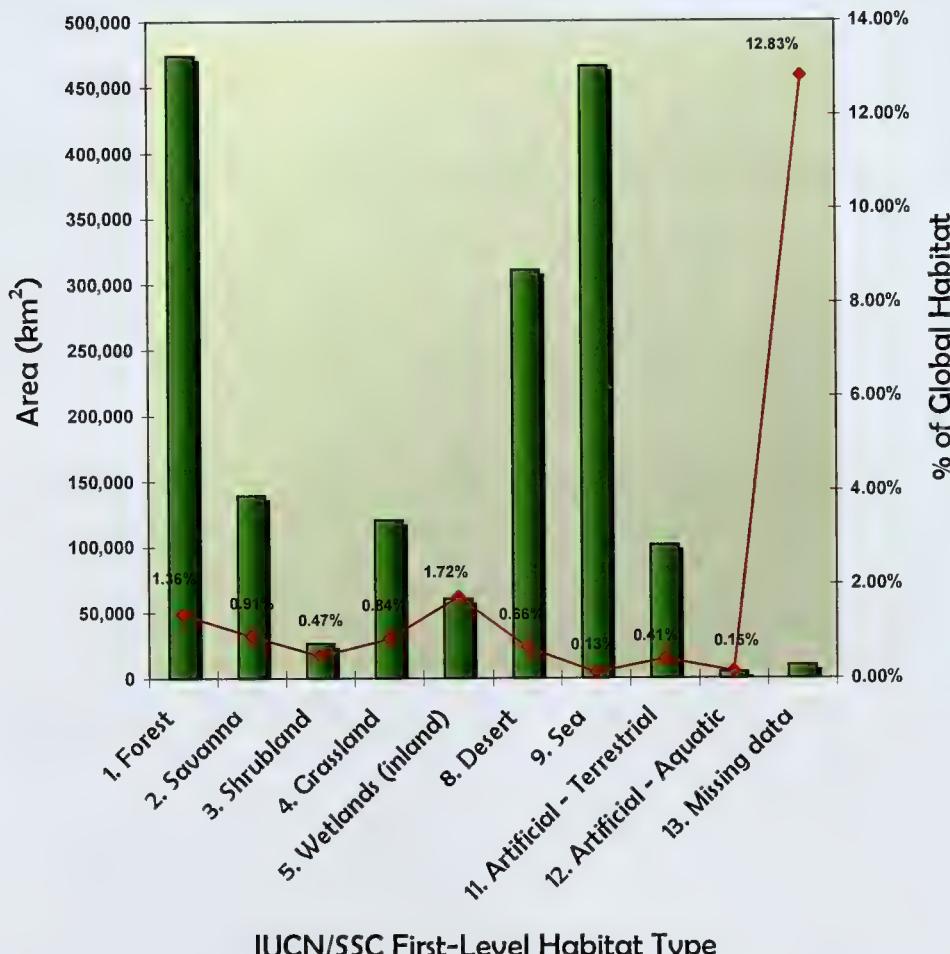
On a global scale, the most common first-level GLCC habitat type in terms of area is forest (474,236 km²), followed by sea (465,669 km²) and then desert (310,413 km²). However, both sea and desert coverage are heavily skewed by a few large sites. The Great Barrier Reef with 339,223 km² of sea and the Galapagos with 49,097 km² together contain 83.39% of all the sea in WH sites. Two African desert sites, the Aïr and Ténéré National Nature Reserve with 71,373 km² of bare desert and the Tassili N'Ajjer with 96,570 km² of bare desert contain 54.10% of all desert (hot, temperate and cold) contained in WH Sites.

Overall, the 172 WH Sites cover 0.34% of the Earth's surface. On a percentage basis, individual habitat occurrence in WH Sites varies from 0.13% (sea) to 1.72% (inland wetlands) – see Figure 11 and Table 17. Note that this analysis is skewed by the planet's large area of marine habitat. If only terrestrial habitats are considered, the picture changes. The average global coverage of terrestrial habitats in WH Sites is 0.84% (Table 17 and Maps 13-18).

Table 17: Relative Coverage of Terrestrial Habitats by World Heritage Sites

IUCN/SSC First Level Habitat Type	Total in WH Sites (km ²)	Global Total (km ²)	% of Global Habitat in WH Sites
1. Forest	474,236	34,763,808	1.36%
2. Savannah	139,127	15,371,900	0.91%
3. Shrubland	26,654	5,617,011	0.47%
4. Grassland	120,345	14,301,308	0.84%
5. Wetlands (inland)	60,465	3,508,569	1.72%
8. Desert	310,413	47,181,833	0.66%
11. Artificial-Terrestrial	101,096	24,443,180	0.41%
12. Artificial-Aquatic	4,841	3,173,032	0.15%
13. Missing data	10,273	80,075	12.83%
Total of Terrestrial Habitat	1,247,449	148,440,716	0.84%

Figure 11: Global Coverage of First-Level IUCN/SSC Habitat Types by World Heritage Sites



3.3.4 IUCN/SSC Second-level Habitat Types

It was not possible to distinguish second-level IUCN/SSC habitat types from the GLCC GIS data because there was not a one-to-one correspondence between the two habitat classification systems at the finest level. However, four broad types of forest could be distinguished:

- 1.1 Forest (Temperate and Boreal Needleleaf);
- 1.2 Forest (Temperate Broadleaf and Mixed);
- 1.3 Forest (Tropical Moist); and
- 1.4 Forest (Tropical Dry).

This was achieved by splitting GLCC habitat types along the Tropic of Cancer and Tropic of Capricorn. For example, Deciduous Broadleaf Forest was split into tropical and non-tropical components as Deciduous Broadleaf Forest (tropics) and Deciduous Broadleaf Forest. A similar division was made for Evergreen Broadleaf Forest; Conifer Forest; and Moist Eucalyptus. Results are shown in Table 18.

Table 18: Forest Coverage within World Heritage Sites (km²)

Second-level Forest Habitat Type	Africa	Asia	Oceania/Australasia	Europe	North America	South America	WHS Total	Global Total	% in WHS
1.1 Temperate & boreal needleleaf	7	24,738		26,884	61,788	18	113,435	11,458,257	0.99%
1.2 Temperate broadleaf & mixed	5,264	51,373	27,088	11,526	32,755	4,007	132,014	10,188,771	1.30%
1.3. Tropical moist	30,280	14,584	1,485	17	3,240	126,595	176,200	10,400,654	1.69%
1.4. Tropical dry	40,159	1,567	6,044	16	338	4,464	52,587	2,716,126	1.94%
Total	75,709	92,261	34,617	38,443	98,122	135,084	474,236	34,763,808	1.36%

Temperate and boreal needleleaf forest is the least common forest type (0.99% of global habitat protected in WH Sites). In Africa only 7 km² of temperate and needleleaf forest are protected in WH sites, although the continent has many juniper forests (e.g. in the Atlas Mountains); and in South America only 18 km². Tropical dry forest is the most common forest habitat type (1.94%) in the World Heritage network.

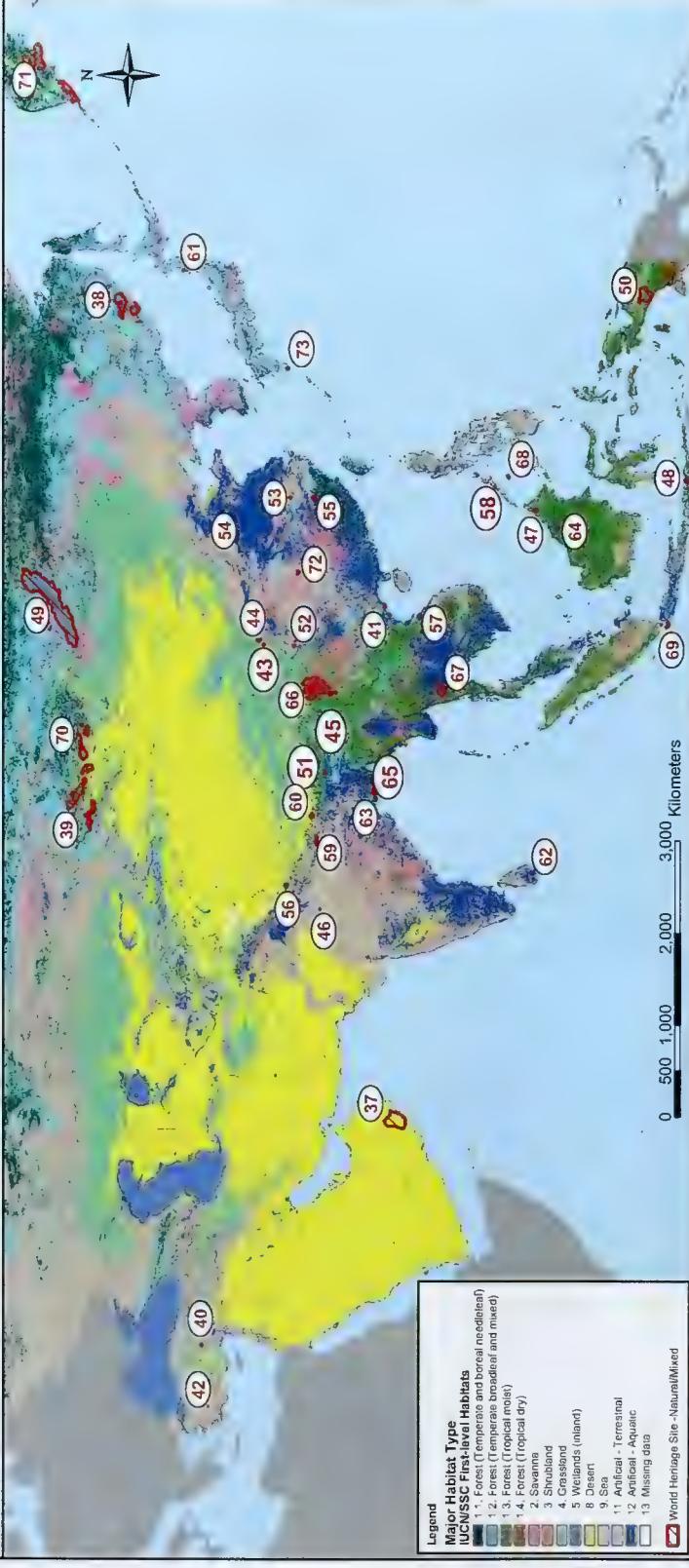
3.3.5 Dominant Habitats

The dominant habitats in terms of actual area within each WH Site were calculated using the GLCC and GIS data (see Table 19). However, these data did appear to have doubtful reliability. For example, the dominant habitat in the Serengeti National Park was recorded by GLCC as Crops and Town, comprising 3,828 km² or 28.8% of its area. This might be explained by distortion of datasets when converting from different geographical projections causing displacement of boundaries, as the Serengeti is actually bordered on the western side by fairly dense “shamba” cultivation and villages. However, the mountainous Rwenzori National Park in Uganda supposedly contains 49 km² of mangroves! A large number of sites (27) also had “Sea” as the dominant habitat, probably because they featured a littoral component, far more than one would expect from an intuitive examination of the WH sites dataset.

Table 19: Dominant Habitats (calculated by area) in World Heritage Sites grouped by Continent/Region

Habitat Type	No. of WH Sites						
	Africa	Asia	Oceania	Europe	North America	South America	Total
1.1. Forest (Temperate and boreal needleleaf)		3		1	8		12
1.2 Forest (Temperate broadleaf and mixed)		6	4	5	3	4	22
1.3 Forest (Tropical moist)	4	4				9	17
1.4 Forest (Tropical dry)	3		1				4
2. Savanna	12	1	4			3	20
3. Shrubland				1	1	5	7
4. Grassland	1	4	1	1		1	8
5. Wetlands (inland)	3	2		3			8
8. Desert	5	3	2	3	3	1	17
9. Sea	3	4	7	6	2	5	27
11. Artificial-Terrestrial	3	7		8	2	3	23
12. Artificial-Aquatic		3					3
13. Missing data	2		1		1		4
Total	36	37	20	28	20	31	172

World Heritage Sites & IUCN/SSC First-level Habitat Types in Asia



Habitat Types Not Displayed:

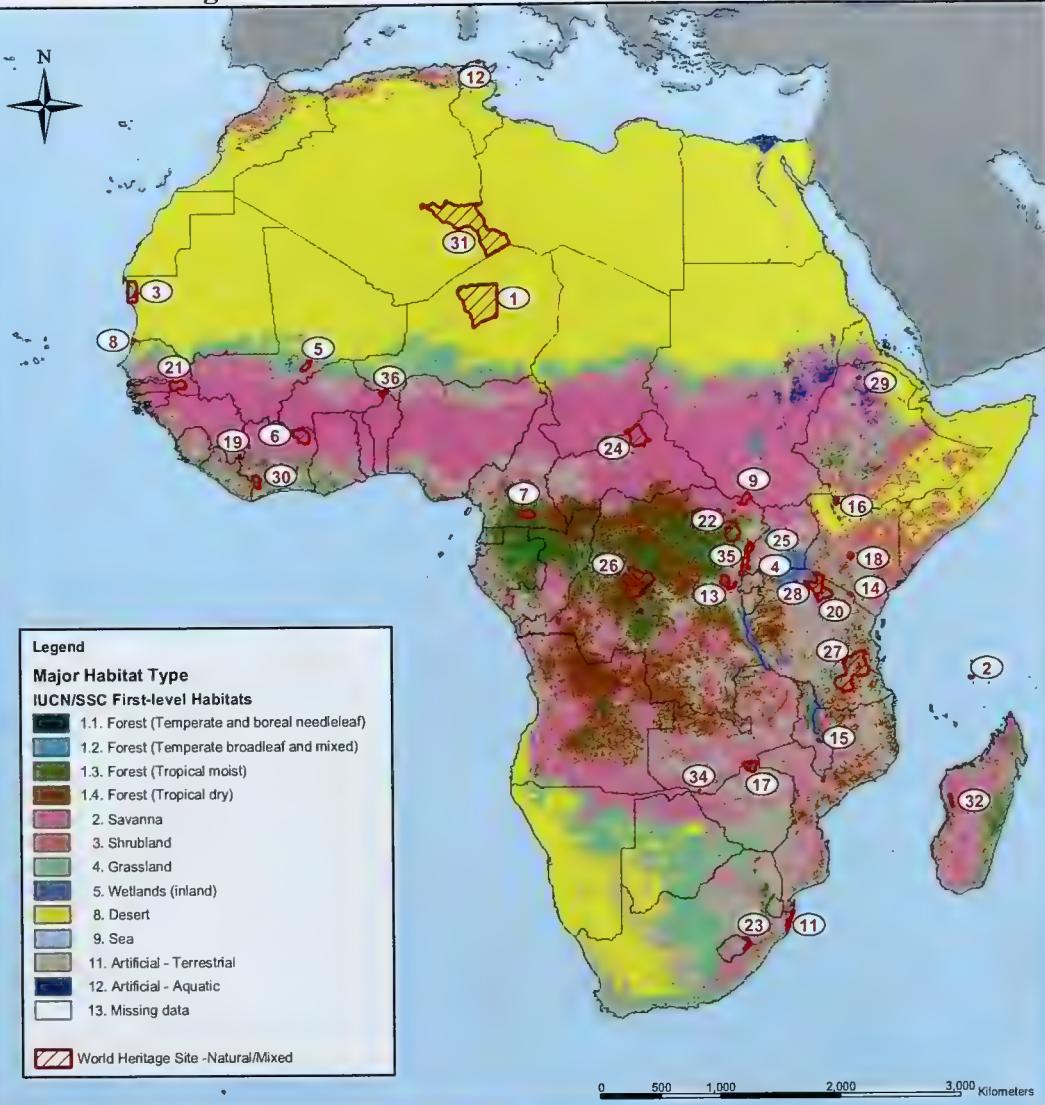
- 6.0 Rocky Barren Areas
- 7.0 Subtropical
- 10.0 Coastline/Intertidal

Forest (Habitat 1.0) was broken down into 4 non-IUCN subtypes

Geographic Projection
Compiled by M. Mason
Date printed: May 2004
Source: USGS GLCC Database &
UNEP-WCMC WDPA V6.1 Datasets

Map 13

World Heritage Sites & IUCN/SSC First-level Habitat Types in Africa



World Heritage Sites

1. Ar and Tchad Natural Reserves
2. Aldabra Atoll
3. Banc d'Arguin National Park
4. Bwindi Impenetrable National Park
5. Cliffs of Bandiagara (Land of the Dogons)
6. Comoé National Park
7. Dja Faunal Reserve
8. Djoudj National Bird Sanctuary
9. Garamba National Park
10. Gough Island Wildlife Reserve
11. Greater St Lucia Wetland Park
12. Ichkeul National Park
13. Kahuzi - Biega National Park
14. Kilimanjaro National Park
15. Lake Malawi National Park
16. Lake Turkana National Parks
17. Mana Pools National Park, Sapi and Chewore Safari Areas
18. Mount Kenya National Park/Forest
19. Mount Nimba Reserves
20. Ngorongoro Conservation Area
21. Niokolo - Koba National Park
22. Okapi Faunal Reserve
23. Okhahlamba - Drakensberg Park
24. Parc National de Manovo - Gounda - St Floris
25. Rwenzori Mountains National Park
26. Salonga National Park
27. Selous Game Reserve
28. Serengeti National Park
29. Simen National Park
30. Ta National Park
31. Tassili N'Ajjer
32. Tsingy de Bemaraha Strict Nature Reserve
33. Vallée de Mai Nature Reserve
34. Victoria Falls/Mosi-oa-Tunya
35. Virunga National Park
36. 'W' National Park

Habitat Types Not Displayed:

- 6.0 Rocky Barren Areas
- 7.0 Subterranean
- 10.0 Coastline/Intertidal

Forest (Habitat 1.0) was broken down into 4 non-IUCN subtypes

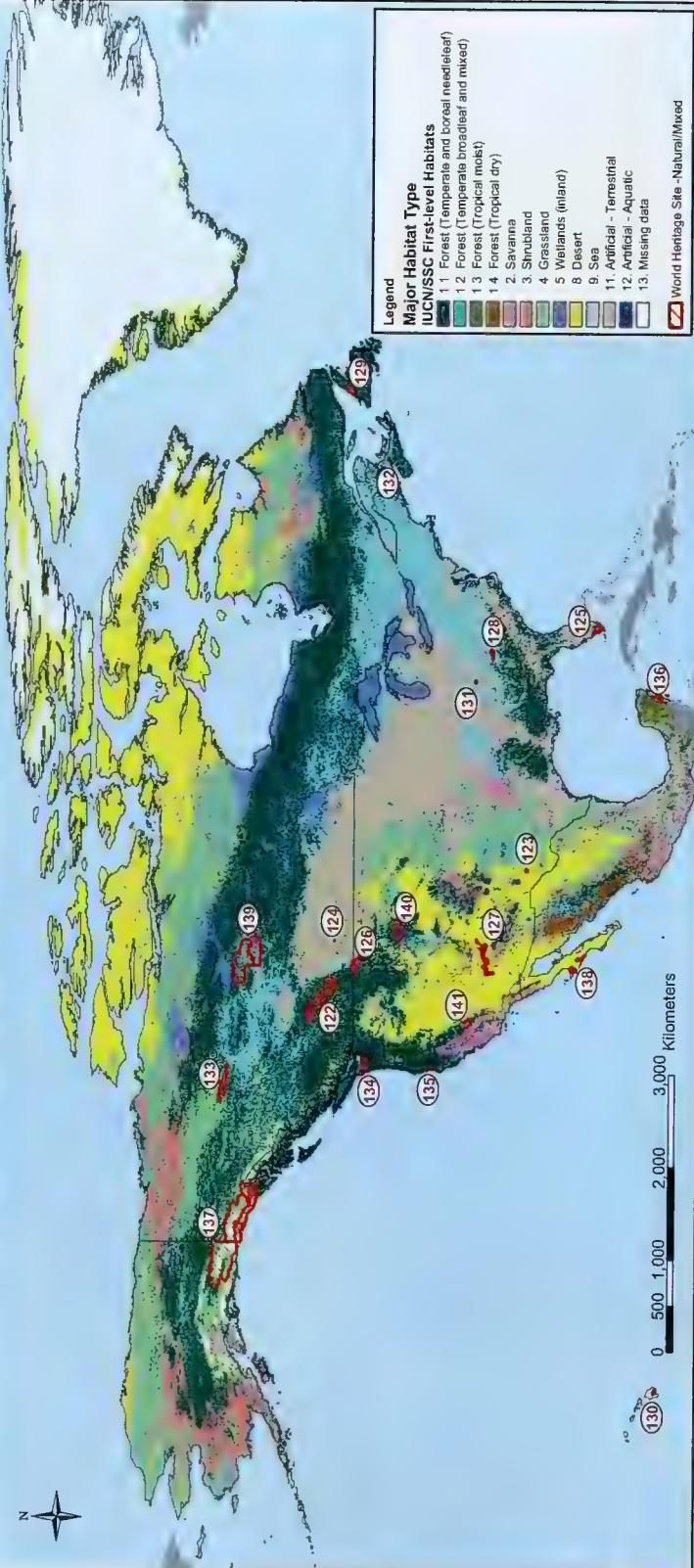
Geographic Projection

Compiled by: M. Mason, L. Fish
Date printed: May 2004

Source: USGS GLCC Dataset &
UNEP-WCMC WDPA V 6.1 Dataset

Map 14

World Heritage Sites & IUCN/SSC First-level Habitat Types in North America



World Heritage Sites

- 122. Canadian Rocky Mountain Parks
- 123. Carlsbad Caverns
- 124. Dinosaur Provincial Park
- 125. Everglades National Park
- 126. Glacier and Waterton Lakes National Park
- 127. Grand Canyon National Park
- 128. Great Smoky Mountains National Park
- 129. Gros Morne National Park
- 130. Hawaii Volcanoes National Park
- 131. Mammoth Cave National Park
- 132. Mesa Verde National Park
- 133. Nahanni National Park
- 134. Olympic National Park
- 135. Redwood National Park
- 136. Sian Ka'an
- 137. Taishan - Alask/ Kuan/ Wariell - St Elias/ Glacier Bay/ Whales Sanctuary of El Vizcaino
- 138. Wood Buffalo National Park
- 139. Yellowstone
- 141. Yosemite National Park

Habitat Types Not Displayed:

- 6.0 Rocky Barren Areas
- 7.0 Subterranean
- 10.0 Coastline/Intertidal

Forest (Habitat 1.0) was broken down into 4 non-IUCN subtypes

Geographic Projection
Compiled by: M. Mason
Date printed: May 2004
Source: USGS GLCC Dataset &
UNEP-WCMC/WSPA V 6 Dataset

Map 15

World Heritage Sites & IUCN/SSC First-level Habitat Types in South America



World Heritage Sites

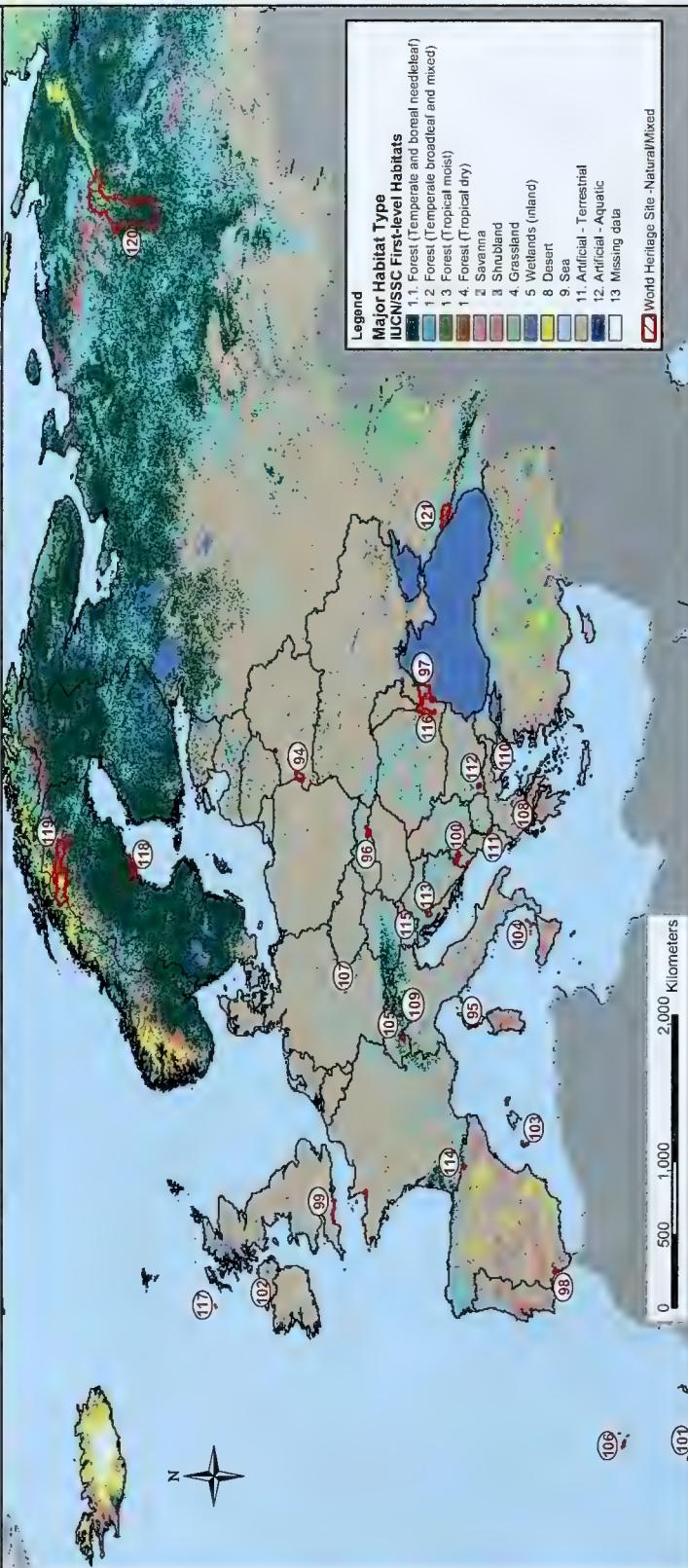
- 142. Alejandro de Humboldt National Park
- 143. Area de Conservación Guanacaste
- 144. Belize Barrier Reef Reserve System
- 145. Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves
- 146. Canaima National Park
- 147. Central Amazon Conservation Complex
- 148. Central Suriname Nature Reserve
- 149. Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks
- 150. Cocos Island National Park
- 151. Darien National Park
- 152. Desembarco del Granma National Park
- 153. Discovery Coast Atlantic Forest Reserves
- 154. Galapagos Islands
- 155. Historic Sanctuary of Machu Picchu
- 156. Huascaran National Park
- 157. Iguazu National Park
- 158. Iguaçu National Park
- 159. Ischigualasto - Talampaya Natural Parks
- 160. Los Glaciares
- 161. Los Katíos National Park
- 162. Manu National Park
- 163. Morne Trois Pitons National Park
- 164. Noel Kempff Mercado National Park
- 165. Pantanal Conservation Complex
- 166. Península Valdés
- 167. Rio Abiseo National Park
- 168. Río Plátano Biosphere Reserve
- 169. Sangay National Park
- 170. Southeast Atlantic Forest Reserves
- 171. Talamanca Range - La Amistad Reserves
- 172. Tikal National Park

Geographic Projection
Compiled by: M. Doughty
Date printed: February 2004

Source: UNEP-WCMC WDPA V 6 Dataset
WWF G200 Ecoregions

Map 16

World Heritage Sites & IUCN/SSC First-level Habitat Types in Europe



World Heritage Sites

94. Biebrzański Park Narodowy / Białowieska Puszcza / Białowieska National Park (Belarus and Poland)
95. Cape Girotaia, Cape Porto & Scandola Nature Reserves in Corsica
96. Caves of Aggtelek and Slovak Karst (Hungary and Slovakia)
97. Danube Delta
98. Doñana National Park
99. Dorsen and East Devon Coast
100. Durmitor National Park
101. Garajonay National Park
102. Giant's Causeway and Causeway Coast
103. Ibiza: Biodiversity and Culture
104. Isole Eolie (Aeolian Islands)
105. Jungfrau - Aletsch - Bleischtorn
106. Laurisilva of Madeira
107. Messel Pit Fossil Site
108. Meteora
109. Monte San Giorgio
110. Mount Athos
111. Ohrid Region with its Cultural/Historical Aspect and its Natural Environment
112. Pilivtsi Lakes National Park
113. Pyrénées - Mont Perdu (France and Spain)
114. Skocjan Caves
115. Srebarna Nature Reserve
116. St. Kilda
117. The High Coast
118. The Laponian Area
119. Virgin Komi Forests
120. Western Caucasus
121. World Heritage Site - Natural/Mixed

Geographic Projection

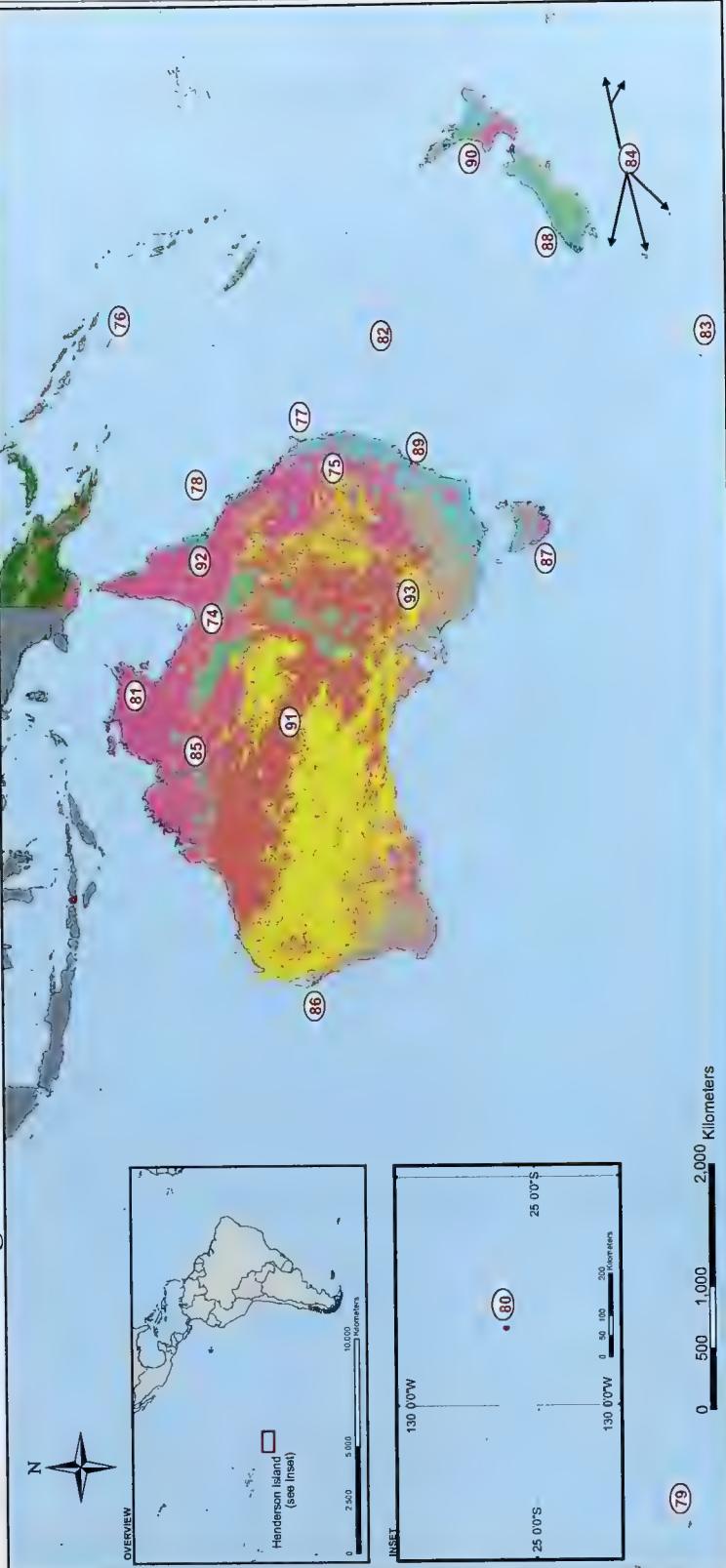
Compiled by M. Mason, L. Fish

Date printed: May 2004

Source: IUCN GLC/C Database & UNEP-WCMC/WIPIA / G Dataset

Map 17

World Heritage Sites & IUCN/SSC First-level Habitat Types in Oceania/Australasia



World Heritage Sites

- 74. Australian Fossil Mammal Sites (Riversleigh / Naracoorte)
- 75. Central Eastern Australian Rainforest
- 76. East Rennell
- 77. Fraser Island
- 78. Great Barrier Reef
- 79. Heard and McDonald Islands
- 80. Henderson Island
- 81. Kakadu National Park
- 82. Lord Howe Island Group
- 83. Macquarie Island
- 84. New Zealand Sub - Antarctic Islands
- 85. Purnululu National Park
- 86. Shark Bay Western Australia
- 87. Tasmanian Wilderness
- 88. Te Wahipounamu - South West New Zealand
- 89. The Greater Blue Mountains Area
- 90. Tongariro National Park
- 91. Uluru - Kata Tjuta National Park
- 92. Wet Tropics of Queensland
- 93. Willandra Lakes Region

Plate Carrée Projection

Compiled by M. Mason

Date printed: May 2004

Source: BirdLife International (2004) originally published in

States of the World's Birds 2004. A

and Wren, D.C.

for BirdLife International, Cambridge, UK. BirdLife International

(Birdlife Conservation Series 7) & UNEP-WCMC WDPA V 6.1

(Birdlife Conservation Series 7) & UNEP-WCMC WDPA V 6.1

Map 18

4. Biodiversity Analyses

4.1 Biodiversity Hotspots

The distribution of biodiversity around the globe is uneven, with some areas having far greater diversity of living organisms than others. In the late 1980s British ecologist Norman Myers first formulated and popularised the idea that areas rich in species, which he described as “hotspots”, should be the focus for conservation efforts on the basis that more species could be conserved for a given investment (Myers 1988). The identification of such biodiversity hotspots has become a widely accepted method of prioritising and targeting conservation activities and investments to have the greatest impact.

Conservation International (CI) has created the most well known system of biodiversity hotspots, using two factors for designation³: regions that harbor a great diversity of endemic species and, at the same time, have been significantly impacted and altered by human activities. Plant diversity is used as the biological basis for hotspot designation. To qualify as a hotspot, a region must support 1,500 endemic plant species or 0.5 percent of the global total. Existing primary vegetation is also the basis for assessing human impact in a region - to qualify a region must have lost more than 70 percent of its original habitat. CI uses plants as qualifiers because they are the basis for diversity in other taxonomic groups. However, the diversity of endemic vertebrates in hotspot regions is also extraordinarily high. Twenty-five priority hotspots, representing a variety of global ecosystems, have been identified. They cover less than 2% of global terrestrial ecosystems, yet account for 44% of all vascular plant species and 38% of birds, mammals, reptiles and amphibian vertebrate groups.

A total of 56 (32.6%) WH Sites are situated in 21 (84%) of CI's 25 hotspots (Table 20 and Maps 19-24). These 56 WH sites cover 188,929 km² of hotspot or 1.19% of the total global hotspot area of 15,824,302 km². Because hotspots are generally very large (average size approximately 633,000 km²) in comparison to WH Sites (average size 9,960 km²) no WH Site occupies more than one hotspot. According to GIS data 29 WH Sites lie entirely within hotspots, as do more than 90% of a further eight sites.

Coverage of hotspots in WH Sites ranges from zero to 12.47% in the Eastern Arc Mountains and Coastal Forests of Kenya and UR Tanzania (Table 21). The four hotspots currently without any WH Site coverage are the South Africa Cape Floristic Region; Africa's Western Cape/Succulent Karoo; Central Chile and New Caledonia. However, South Africa has nominated the Cape Floristic Region and it will be assessed by the World Heritage Committee at its June 2004 meeting.

³ Source: Conservation International at www.biodiversityhotspots.org/xp/Hotspots/hotspotsScience/

Table 2O: World Heritage Sites occurring in Conservation International Biodiversity Hotspots

Hotspot Name	WH Site	Country	Area of WHS in hotspot (km²)	Size of WHS (km²)	% WHS in hotspots
Atlantic Forest	Iguazu National Park	Argentina	593.84	593.84	100.00
	Atlantic Forest Southeast Reserves Discovery Coast Atlantic Forest Reserves	Brazil	15,036.40 18,799.32	19,091.08 22,879.05	78.76 82.17
Brazilian Cerrado	Iguacu National Park		1,390.59	1,390.59	100.00
	Noel Kempff Mercado National Park	Bolivia	378.38	10,961.72	3.45
Brazilian Cerrado Parks	Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks	Brazil	5,365.02	5,487.90	97.76
	Redwood National Park	USA	394.03 3,053.26	419.05 3,053.26	94.03 100.00
California Floristic Province	Yosemite National Park		689.73	708.33	97.38
	Alejandro de Humboldt National Park	Cuba	291.25	326.59	89.18
Caribbean Park	Desembarco del Gramma National Park	Dominica	67.22	67.22	100.00
	Morne Trois Pitons National Park	United States	3,512.86	5,734.78	61.26
Caucasus	Everglades National Park	Russian Federation	3,595.36	3,595.36	100.00
	Western Caucasus	Huanglong Scenic and Historic Interest Area	151.30	151.30	100.00
China	Jiuzhaigou Valley Scenic and Historic Interest Area	China	611.82	611.82	100.00
	Three Parallel Rivers of Yunnan Protected Areas		20,741.63	21,297.69	97.39
Choco-Darien-Western Ecuador	Los Katios National Park	Colombia	588.37	588.37	100.00
	Darien National Park	Panama	5,533.30	5,582.23	99.12
Eastern Arc Mountains & Coastal Forests	Selous Game Reserve	UR Tanzania	24,044.27	47,864.22	50.23
	Tai National Park	Côte d'Ivoire	4,382.27	4,382.27	100.00
Guinean Forests of West Africa	Mount Nimba Strict Nature Reserve	Côte d'Ivoire + Guinea	150.66	150.66	100.00
	Kaziranga National Park	India	317.27	317.27	100.00
Indo-Burma	Manas Wildlife Sanctuary		561.47	561.47	100.00
	Royal Chitwan National Park	Nepal	1,144.17	1,145.09	99.92
	Thungyai-Huai Kha Khaeng Wildlife Sanctuaries	Thailand	5,915.54	5,915.54	100.00

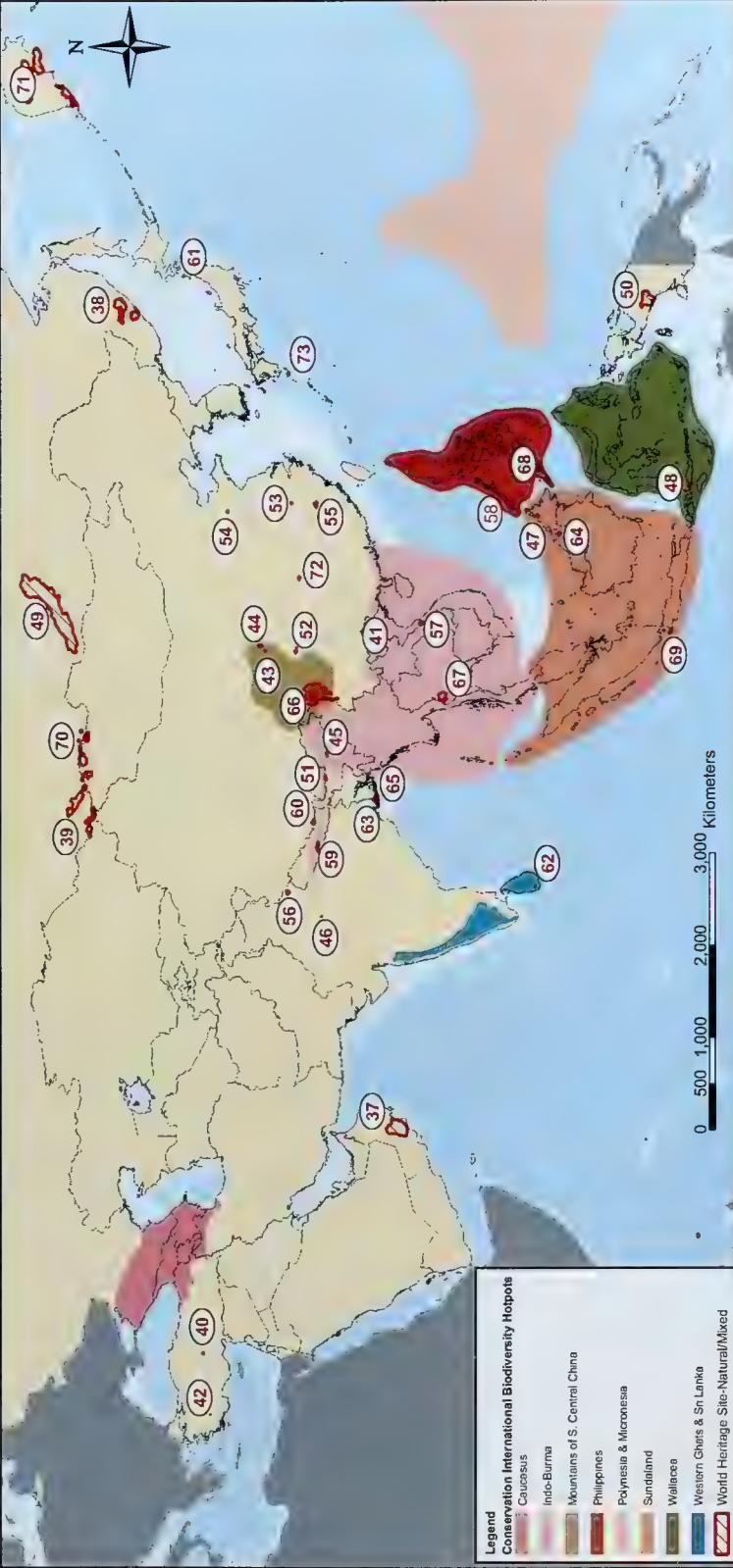
	Ha Long Bay	Viet Nam	1.46	419.31	0.35
	Phong Nha-Ke Bang National Park		895.94	895.94	100.00
Madagascar & Indian Ocean Islands	Tsingy de Bemaraha Strict Nature Reserve	Madagascar	1,476.94	1,476.94	100.00
	Aldabra Atoll	Seychelles	129.48 0.19	160.15 0.19	80.85 100.00
	Valleé de Mai Nature Reserve				
	Cape Girolata, Cap e Porto, Scandola Nature Reserve and the Piana Calanches in Corsica	France	33.45	119.38	28.02
	Laurisilva of Madeira	Portugal	127.85	127.85	100.00
	Garajonay National Park	Spain	65.11	65.11	100.00
	Ibiza, biodiversity and culture		37.91	153.65	24.67
	Belize Barrier-Reef Reserve system	Belize	45.08	1,135.36	3.97
	Area de Conservación Guanacaste		815.72	1,252.99	65.10
	Talamanca Range-La Amistad Reserves / La Amistad National Park	Costa Rica	1,968.13	1,968.13	100.00
	Tikal National Park	Guatemala	8,876.87	8,876.87	100.00
	Río Plátano Biosphere Reserve	Honduras	3,975.59	4,000.95	99.37
	Sian Ka'an	Mexico	3,704.66	5,299.97	69.90
	Te Wahipounamu - South West New Zealand	New Zealand	23,454.56	25,159.31	93.22
	Tongariro National Park		683.76	683.76	100.00
	Puerto-Princesa Subterranean River National Park	Philippines	50.42	54.27	92.90
	Henderson Island	UK	37.59	41.19	91.25
	Hawaii Volcanoes National Park	USA	687.93	717.04	95.94
	Shark Bay, Western Australia	Australia	4,495.38	22,545.13	19.94
	Ujung Kulon National Park	Indonesia	495.26	651.23	76.05
	Kinabalu Park	Malaysia	756.73	756.73	100.00
	Gunung Mulu National Park		535.34	535.34	100.00
	Sangay National Park	Ecuador	5,697.62	5,697.62	100.00
	Historic Sanctuary of Machu Picchu		372.28	372.28	100.00
	Huascaran National Park	Peru	2,915.82	3,288.41	88.67
	Manu National Park		6,309.41	14,844.92	42.50
	Rio Abiseo National Park		2,348.22	2,846.50	82.49
	Komodo National Park	Indonesia	529.57	1,785.31	29.66
	Sinhalaia Forest Reserve	Sri Lanka	95.81	95.81	100.00
	Western Ghats				

Table 21: Overall Coverage of CI Hotspots in World Heritage Sites

Biodiversity Hotspot	Area in WH Sites (km ²)	Total hotspot area (km ²)	% of hotspot contained in WH Sites
Africa's Western Cape/Succulent Karoo	0	104,467	0.00
Atlantic Forest	35,820	1,482,983	2.42
Brazilian Cerrado	5,743	1,831,454	0.31
California Floristic Province	3,447	352,065	0.98
Caribbean	4,561	259,634	1.76
Caucasus	3,595	556,184	0.65
Central Chile	0	292,225	0.00
Choco-Darién-Western Ecuador	6,122	226,575	2.70
Eastern Arc Mountains & Coastal Forests	24,044	192,805	12.47
Guinean Forests of West Africa	4,533	881,111	0.51
Indo-Burma	8,836	2,287,772	0.39
Madagascar & Indian Ocean Islands	1,607	602,141	0.27
Mediterranean Basin	264	529,815	0.05
Mesoamerica	19,386	1,154,778	1.68
Mountains of S. Central China	21,505	557,495	3.86
New Caledonia	0	19,166	0.00
New Zealand	24,138	267,116	9.04
Philippines	50	295,855	0.02
Polynesia & Micronesia	726	48,106	1.51
South Africa Cape Floristic Region	0	75,000	0.00
Southwest Australia	4,495	308,623	1.46
Sundaland	1,787	1,497,444	0.12
Tropical Andes	17,643	1,405,808	1.26
Wallacea	530	339,089	0.16
Western Ghats & Sri Lanka	96	256,594	0.04
TOTAL	188,929	15,824,302	1.19

Note: Shaded rows indicate hotspots with <1.0% inclusion in a WH Site

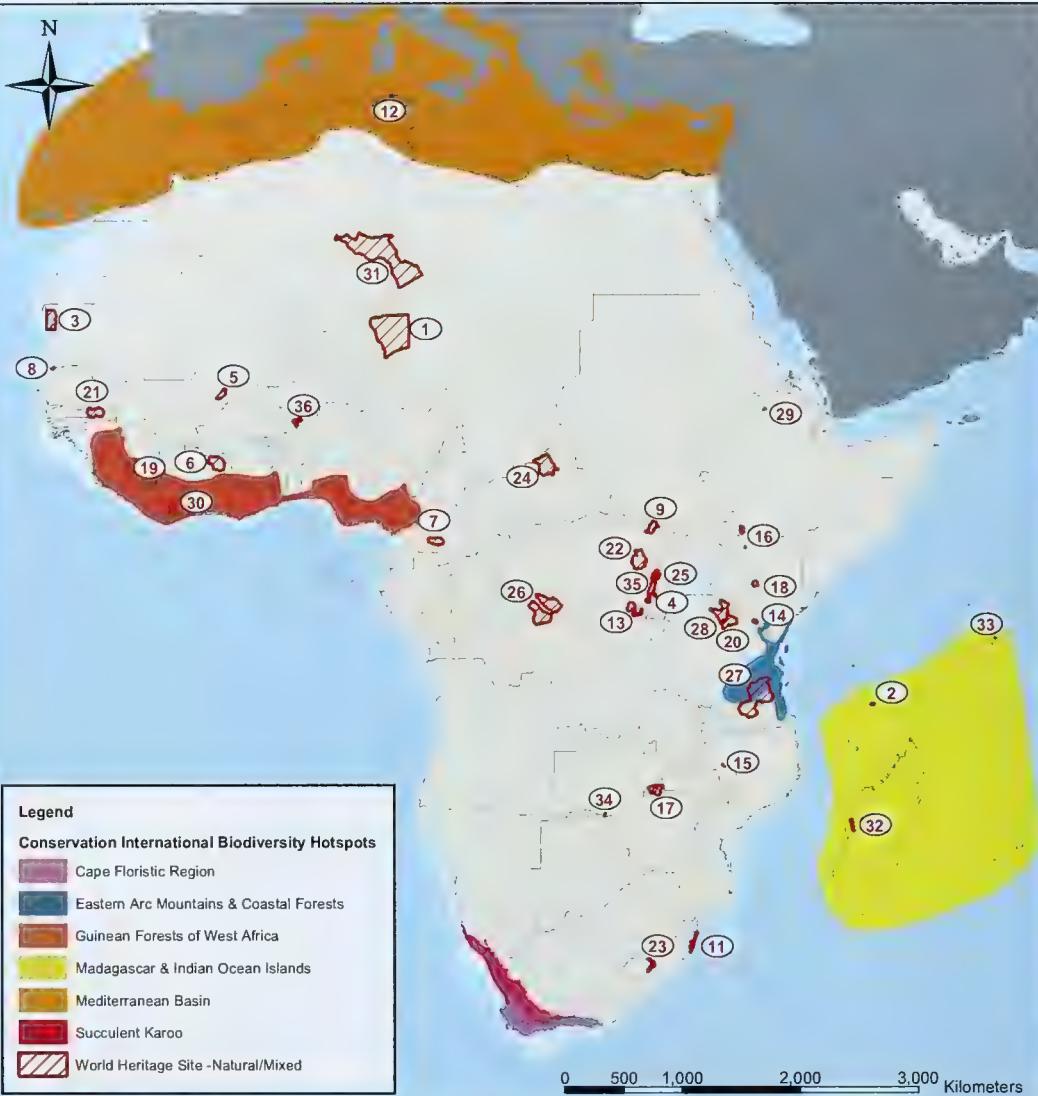
World Heritage Sites & Conservation International Biodiversity Hotspots in Asia



Geographic Projection
Compiled by: M. Mason
Revised by: L. Fish
Date printed: May 2004
Source: Conservation International (2001)
Biodiversity Hotspots Conservation Action Program
Washington, DC & UNEP-WCMC WebAtlas 1 Dataset

Map 19

World Heritage Sites & Conservation International Biodiversity Hotspots in Africa



World Heritage Sites

1. Ar Tchir Natural Reserves
2. Aldabra Atoll
3. Banc d'Arguin National Park
4. Bwindi Impenetrable National Park
5. Cliffs of Bandiagara (Land of the Dogons)
6. Comoé National Park
7. Djia Faunal Reserve
8. Djoudj National Bird Sanctuary
9. Garamba National Park
10. Gough Island Wildlife Reserve
11. Greater St Lucia Wetland Park
12. Ichkeul National Park
13. Kahuzi - Biega National Park
14. Kilimanjaro National Park
15. Lake Malawi National Park
16. Lake Turkana National Parks
17. Mana Pools National Park, Sapi and Chewore Safari Areas
18. Mount Kenya National Park/Forest
19. Mount Nimba Reserves
20. Ngorongoro Conservation Area
21. Niokolo - Koba National Park
22. Okapi Faunal Reserve
23. Okhaflambe - Drakensberg Park
24. Parc National de Manovo - Gounda - St Floris
25. Rwenzori Mountains National Park
26. Salonga National Park
27. Selous Game Reserve
28. Serengeti National Park
29. Simen National Park
30. Ta National Park
31. Tassili N'Ajjer
32. Tsingy de Bemaraha Strict Nature Reserve
33. Vallée de Mai Nature Reserve
34. Victoria Falls/Mosi-oa-Tunya
35. Virunga National Park
36. 'W' National Park

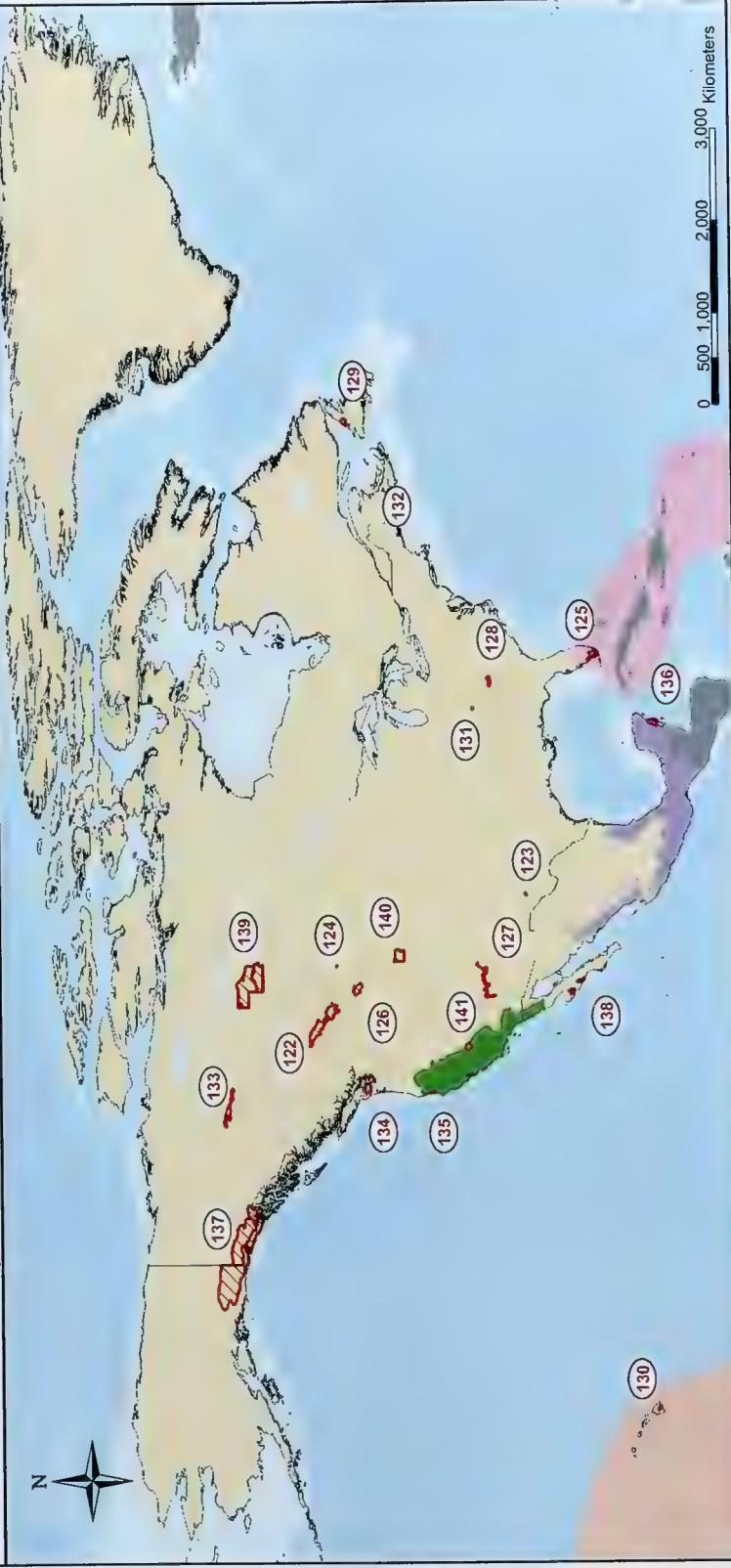
Geographic Projection

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Date printed: May 2004

Source: Conservation International (2001)
Biodiversity Hotspots. Conservation International:
Washington, DC & UNEP-WCMC WDPA V.8.1 Dataset

Map 20

World Heritage Sites & Conservation International Biodiversity Hotspots in North America



World Heritage Sites

- 122. Canadian Rocky Mountain Parks
- 123. Carlsbad Caverns
- 124. Dinosaur Provincial Park
- 125. Everglades National Park
- 126. Glacier and Waterton Lakes National Park
- 127. Grand Canyon National Park
- 128. Great Smoky Mountains National Park
- 129. Gross Morne National Park
- 130. Hawaii Volcanoes National Park
- 131. Mammoth Cave National Park
- 132. Miguasha Park
- 133. Nahanni National Park
- 134. Olympic National Park
- 135. Redwood National Park
- 136. Sian Ka'an
- 137. Tatshenshini - Alsak/Kluane/Wrangle - St Elias/Glacier Bay
- 138. Whale Sanctuary of El Vizcaíno
- 139. Wood Buffalo National Park
- 140. Yellowstone
- 141. Yosemite National Park

Legend

-  World Heritage Site-Natural/Mixed
-  Conservation International Biodiversity Hotspots
-  California Floristic Province
-  Caribbean
-  Mesoamerica
-  Mountains of S. Central China
-  Polynesia & Micronesia

Geographic Projection

Compiled by: M. Mason

Revised by: L. Fish

Date printed: May 2004

Source: Conservation International (2001)
Biodiversity Hotspots. Conservation International,
Washington, DC & UNEP-WCMC WCPA v 6.1 Dataset

Map 21

World Heritage Sites & Conservation International Biodiversity Hotspots in South America



World Heritage Sites

- 142. Alejandro de Humboldt National Park
- 143. Área de Conservación Guanacaste
- 144. Belize Barrier Reef Reserve System
- 145. Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves
- 146. Canaima National Park
- 147. Central Amazon Conservation Complex
- 148. Central Suriname Nature Reserve
- 149. Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks
- 150. Cocos Island National Park
- 151. Darién National Park
- 152. Desembarco del Granma National Park
- 153. Discovery Coast Atlantic Forest Reserves
- 154. Galápagos Islands
- 155. Historic Sanctuary of Machu Picchu
- 156. Huascarán National Park
- 157. Iguazú National Park
- 158. Iguaçu National Park
- 159. Ischigualasto - Talampaya Natural Parks
- 160. Los Glaciares
- 161. Los Katíos National Park
- 162. Manu National Park
- 163. Morne Trois Pitons National Park
- 164. Noel Kempff Mercado National Park
- 165. Pantanal Conservation Complex
- 166. Península Valdés
- 167. Río Abiseo National Park
- 168. Río Plátano Biosphere Reserve
- 169. Sangay National Park
- 170. Southeast Atlantic Forest Reserves
- 171. Talamancas Range - La Amistad Reserves
- 172. Tikal National Park

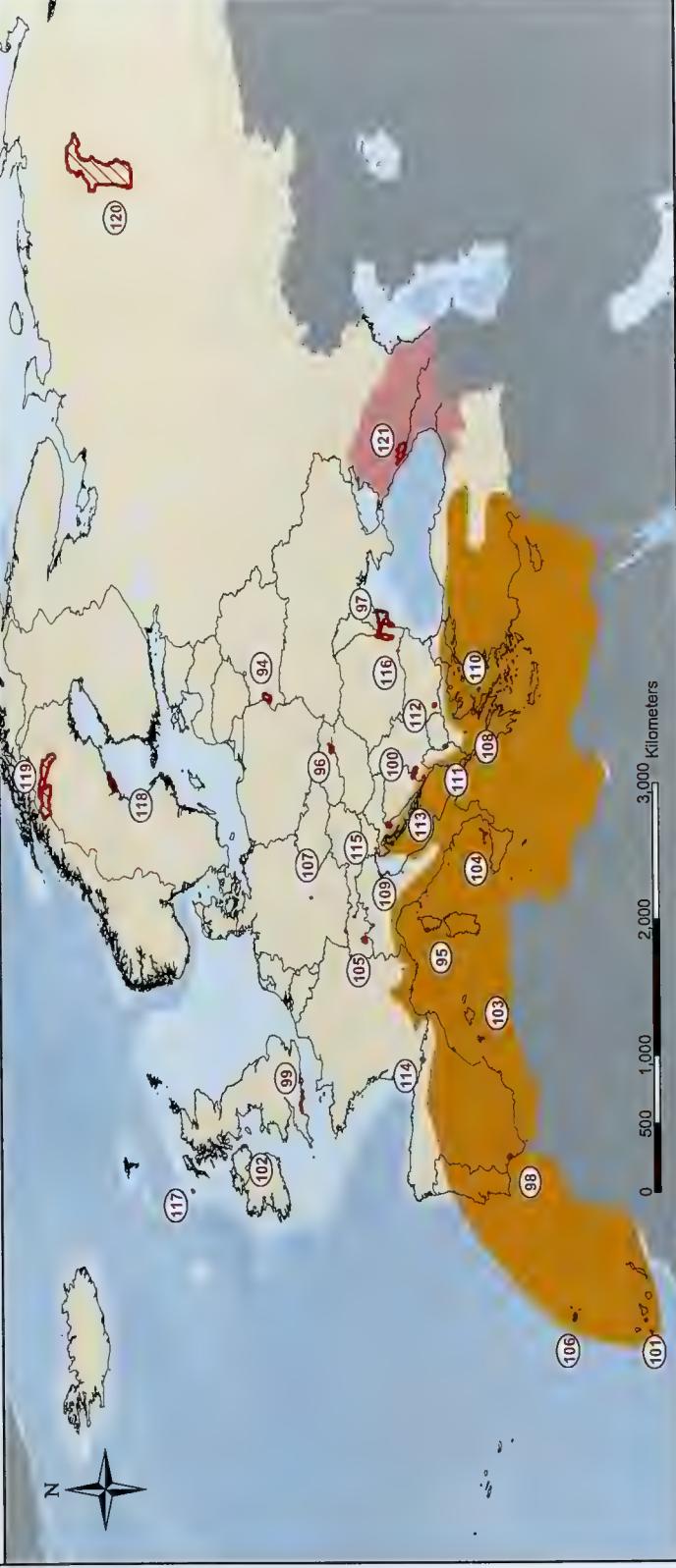
Geographic Projection

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Date printed: May 2004

Source: Conservation International (2001)
Biodiversity Hotspots. Conservation International:
Washington, DC & UNEP-WCMC WCPA V 6.1 Dataset

Map 22

World Heritage Sites & Conservation International Biodiversity Hotspots in Europe



World Heritage Sites

- 94. Belovezhskaya Pushcha / Białowieża National Park (Belarus and Poland)
- 95. Cape Gimelata, Cape Porto & Scandola Nature Reserves in Corsica
- 96. Caves of Aggtelek and Slovak Karst (Hungary and Slovakia)
- 97. Danube Delta
- 98. Døøra National Park
- 99. Dorset and East Devon Coast
- 100. Durmitor National Park
- 101. Gargajonay National Park
- 102. Giant's Causeway and Causeway Coast
- 103. Iloza, Biodiversity and Culture
- 104. Isole Eolie (Aeolian Islands)
- 105. Jungfrau - Aletsch - Bietschhorn
- 106. Laurisilva of Madeira
- 107. Messel Pit Fossil Site
- 108. Meleora
- 109. Moni San Giorgio
- 110. Mount Athos
- 111. Ohrid Region with its Cultural/Historical Aspect and its Natural Environment
- 112. Pirin National Park
- 113. Plitvice Lakes National Park
- 114. Pyrénées - Mont Perdu (France and Spain)
- 115. Skocjan Caves
- 116. Srebarna Nature Reserve
- 117. St. Kilda
- 118. The High Coast
- 119. The Laponian Area
- 120. Virgin Komi Forests
- 121. Western Caucasus

Legend
Conservation International Biodiversity Hotspots

Caucasus
Mediterranean Basin
World Heritage Site-Natural/Mixed

Geographic Projection
Compiled by: M. Mason
Reviewed by: L. Mish
Date printed: May 2004
Source: Conservation International (2001)
Biodiversity Hotspots Conservation International
Washington, DC & UNEP-WCMC WDPA V6.1 Dataset

Map 23

World Heritage Sites & Conservation International Biodiversity Hotspots in Oceania/Australasia



Flato Carrera Projection
Compiled by M. Mason
Revised by L. Ish
Date printed: May 2004.
Source: Conservation International (2001).
Endemic Hotspot Conservation International (2001).
World Heritage Site - IUCN WCPA v.6.1 (Davies).
Biodiversity Conservation Series 71 & UNEP-WCMC WCPA v.6.1

Map 24

4.2 Endemic Bird Areas

In a major conservation priority setting exercise, BirdLife International has designated approximately 2% of the world's land surface as Endemic Bird Areas or EBAs (Stattersfield *et al.* 1998). These are defined as areas that encompass the breeding ranges of two or more birds whose total breeding ranges are restricted to 50,000 km² or less. Globally 218 different EBAs were identified, covering the ranges of 93% of restricted range birds (2,451 species or roughly 25% of all known bird species). These restricted range species included 816 species classed as internationally threatened by IUCN, that is 74% of all threatened bird species (1998 data). The effective conservation of these EBAs is critical for the maintenance of global avian diversity.

All EBAs are given a conservation priority rating of Critical, Urgent or High, depending on their biological value and severity of current threats to the area. The biological importance of an EBA is measured by the number of restricted-range species occurring in it, and whether they are shared with other EBAs. An additional factor is the size of the EBA. The current threat level was assessed using the percentage of the restricted-range species in each EBA that are internationally threatened and the threat categories of these species. The combination of these criteria resulted in an overall conservation priority rating.

Most EBAs support 2-10 restricted range bird species and are under 30,000 km² in size. The majority (77%) are in the tropics, with very few at temperate latitudes. There are almost equal numbers of continental EBAs (113) and island EBAs (105). Of the island EBAs, 70% are on oceanic islands and 30% are on continental islands.

The total area of all EBAs is 14,236,180 km², while the total area of WH Sites according to GIS data held at UNEP-WCMC is 1,713,370 km², of which 256,955 km² (15%) are classed as EBAs. WH Sites thus cover 1.8% of the global EBA network. Seventy-four EBAs (34%) occur in 83 WH Sites (Table 22 and Maps 25-30). Extent of EBAs in WH Sites varies from 100% to less than one percent. Four EBAs (all islands or island groups) are completely included in WH Sites. These are the Galapagos Islands EBA harbouring 22 restricted range bird species; the Cocos Island EBA harbouring three restricted range species, the Auckland Islands (New Zealand Sub-Antarctic Islands) harbouring two restricted range species and Henderson Island harbouring four restricted range species. Most WH Sites (64) only overlap one EBA, but some cover more. Seventeen WH sites cover two EBAs, for example Lorentz National Park in Indonesia includes 3.7% of EBA 178, the Central Papuan Mountains and 5.49% of EBA 179, the South Papuan Lowlands. Huascarán National Park in Peru covers parts of three EBAs and Sangay National Park in Ecuador covers parts of four EBAs.

There are 144 EBAs (66% of the total number) that currently do not occur in WH Sites. In addition, four EBAs only have small fractions (0.01%) of their area in WH Sites: the South Central American Pacific slope with 15 restricted range species; the Tumbesian region with 55 restricted range species; the Cameroon and Gabon lowlands with six restricted range species; only small percentages (2.01 – 0.02%) of the three EBAs of the Himalayas; and the Central Ethiopian Highlands with five restricted range species. Given the large number of island EBAs, many do not occur in WH Sites. Fifty-one of the EBAs not occurring in WH sites are prioritized as Critical (Table 23).

Major differences in the correlation between the coverage of EBAs and WH Sites include the following:

North, Central and South America, and the Caribbean

- 17 EBAs in southern USA, Mexico and the Pacific coast of Central America;
- many of the island EBAs in the Caribbean (e.g. Puerto Rico, Hispaniola, Jamaica);
- the EBAs of northern Venezuela, Colombia and Ecuador;
- Andean ridge-top forests and the Maranon valley of Ecuador and Peru; and
- yungas of Argentina, Bolivia and Peru, southern Chile, and Atlantic Brazil.

Africa

- EBAs of many of the Atlantic and Indian Ocean islands e.g. Sao Tomé and Principe/Mauritius/Socotra;
- Cameroon Highlands;
- Western Angola;
- Cape Fynbos and South African forests;
- many of the Madagascan EBAs; and
- the arid bush and mountainous EBAs of the Horn of Africa.

Middle East

- Neither of the two Middle Eastern EBAs occur in WH Sites.

Asia

- Western Ghats;
- EBAs in southern Vietnam;
- many of the high altitude EBAs such as Eastern Tibet and the Qinghai Plateau;
- many island EBAs (e.g. the Andaman and Nicobar Islands, Hainan, Taiwan, most of the Philippines and Indonesian island EBAs such as Mindanao and the Eastern Visayas and Sulawesi) do not occur in WH Sites.

Australia/Oceania

- Australia has the best coverage of EBAs in WH Sites of any continent. Six of the seven continental EBAs occur in WH Sites, the only exception being Southwest Australia. Many Pacific Island EBAs are not covered though, the most notable being the Solomon Islands EBA with 61 endemic and 17 other restricted-range species.

Table 22: Occurrence of EBAs in World Heritage Sites

EBA No.	EBA Name	Priority	Biological Importance	Current threat level	World Heritage Site	Country	Area of EBA in WHS (km ²)	Area of WHS (km ²)	%WHS in EBA
1	California	High	2	1	Redwood National Park	USA	273.12	419.05	65.18
19	Central American Caribbean slope	High	2	1	Talamanca Range-La Amistad Reserves/La Amistad National Park	Costa Rica/Panama	57.39	1,968.14	2.92
20	Costa Rica and Panama highlands	Urgent	3	1	Río Plátano Biosphere Reserve Área de Conservación Guanacaste	Honduras Costa Rica	3,991.44 243.83	4,000.95 1,252.99	99.76 19.46
21	South Central American Pacific Slope	High	2	1	Talamanca Range-La Amistad Reserves/La Amistad National Park	Costa Rica/Panama	1,910.74	1,968.14	97.08
22	Cocos Island	Urgent	2	2	Area de Conservación Guanacaste	Costa Rica	3.88	1,252.99	0.31
23	Darién lowlands	Critical	3	2	Cocos Island National Park Los Katíos National Park Darién National Park	Colombia Panama Colombia	37.36 576.12 4,169.95	1,038.89 588.37 5,582.23	3.60 97.92 74.70
24	Darién highlands	High	2	1	Los Katíos National Park Darién National Park Alejandro de Humboldt National Park	Panama Panama	12.25 1,359.28	588.37 5,582.23	2.08 24.35
25	Cuba	Critical	1	3	Alejandro de Humboldt National Park Desembarco del Granma National Park	Cuba	693.17	708.33	97.86
30	Lesser Antilles	Critical	3	2	Morne Trois Pitons National Park	Dominica	269.39	326.59	82.48
31	Galápagos Islands	Urgent	2	2	Galápagos Islands		67.22	67.22	100.00
43	Central Andean páramo	Urgent	2	2	Sangay National Park	Ecuador	7,603.55	57,197.86	13.29
44	Ecuador-Peru East Andes	High	2	1	Sangay National Park		1,545.38	5,697.61	27.12
45	Tumbesian region	Critical	3	2	Sangay National Park Huascará National Park	Ecuador	1,316.06	5,697.61	23.10
46	Southern Central Andes	Urgent	1	2	Sangay National Park		2.28	5,697.61	0.04
49	North-east Peruvian cordilleras	Urgent	3	1	Río Abiseo National Park	Peru	13.53	3,288.42	0.41
						Ecuador	432.89	5,697.61	7.60
						Peru	2,387.64	2,846.50	83.88

50	Junin puna	Critical	1	3	Huascaran National Park	340.11	3,288.42	10.34
51	Peruvian high Andes	Critical	3	3	Huascaran National Park	2,934.78	3,288.42	89.25
					Río Abiseo National Park	2.29	2,846.50	0.08
53	Peruvian East Andean foothills	High	2	1	Historic Sanctuary of Machu Picchu	120.18	372.28	32.28
					Manú National Park	6.44	14,844.91	0.04
55	Bolivian and Peruvian upper yungas	Urgent	3	1	Historic Sanctuary of Machu Picchu	206.25	372.28	55.40
56	High Andes of Bolivia and Argentina	Critical	3	2	Ischigualasto – Talamampaya Natural Parks	356.80	2,462.45	14.49
62	Southern Patagonia	Urgent	3	1	Argentina	850.05	7,173.28	11.85
64	Tepuis	Urgent	3	1	Venezuela	11,222.19	30,455.68	36.85
67	Amazon flooded forests	High	1	1	Brazil	7,961.79	64,424.21	12.36
68	Southeast Peruvian lowlands	Urgent	3	1	Central Amazon Conservation Complex	10,121.56	14,844.91	68.18
					Peru	593.83	593.83	100.00
75	Atlantic forest lowlands	Critical	3	3	Iguazu National Park	10,717.49	19,091.09	56.14
					Brazil	18,984.80	22,879.04	82.98
76	Atlantic forest mountains	Urgent	3	1	Discovery Coast Atlantic Forest Reserves	922.48	1,390.59	66.34
80	Gough Island	Urgent	1	2	Iguaçu National Park	4,167.06	19,091.09	21.83
					Atlantic Forest Southeast Reserves	52.23	64.10	81.49
84	Upper Guinea forests	Critical	3	3	UK	150.66	150.66	100.00
					Côte d'Ivoire and Guinea	Guinea and Côte d'Ivoire	4,382.26	100.00
85	Cameroon and Gabon lowlands	High	1	1	Tai National Park	26.76	6,263.93	0.43
90	Lesotho highlands	High	1	1	Dja Faunal Reserve	964.66	2,282.37	42.27
91	South African Grasslands	Critical	1	3	uKhahlamba/Drakensberg Park	1,317.71	2,282.37	57.73
92	Southeast African coast	High	1	1	South Africa	1,628.39	2,379.66	68.43
93	West Malagasy Dry Forests	High	1	1	Greater St. Lucia Wetland Park	Madagascar	1,476.94	100.00
					Tsingy de Bemaraha Strict Nature Reserve			

99	Aldabra	High	1	1	Aldabra Atoll		Seychelles	0.19	100.00
100	Granitic Seychelles	Critical	2	3	Vallée de Mai Nature Reserve			0.19	100.00
105	Tanzania/Malawi mountains	Critical	3	2	Selous Game Reserve		UR Tanzania	27.31	47,864.22
106	Albertine Rift mountains	Urgent	3	1	Kahuzi-Biega National Park	Democratic Republic of Congo	623.07	5,641.53	11.04
107	Eastern Zaire lowlands	High	1	1	Virunga National Park	Democratic Republic of Congo	1,743.66	7,857.98	22.19
108	Serengeti plains	High	2	1	Bwindi Impenetrable National Park	Uganda	293.48	322.17	91.10
109	Kenyan mountains	Urgent	2	2	Rwenzori Mountains National Park	Uganda	651.44	651.44	100.00
115	Central Ethiopian highlands	Critical	1	3	Kahuzi-Biega National Park	Democratic Republic of Congo	5,012.80	5,641.53	88.86
120	Madeira and the Canary Islands	High	1	1	Okapi Faunal Reserve	Democratic Republic of Congo	621.35	13,937.23	4.46
122	Caucasus	High	1	1	Virunga National Park	Uganda	1,941.02	7,857.98	24.70
124	Sri Lanka	Urgent	1	2	Bwindi Impenetrable National Park	Uganda	26.64	322.17	8.27
128	West Himalayas	Critical	3	2	Ngorongoro Conservation Area	UR Tanzania	8,287.22	8,317.19	99.64
129	Central Himalayas	High	1	1	Serengeti National Park	UR Tanzania	13,307.62	13,307.62	100.00
130	Eastern Himalayas	Urgent	3	1	Mount Kenya National Park/Natural Forest	Kenya	1,441.41	1,441.41	100.00
131	Assam plains	Urgent	1	2	Kilimanjaro National Park	UR Tanzania	671.39	671.39	100.00
137	Central Sichuan mountains	High	2	1	Simien National Park	Ethiopia	5.90	134.50	4.39
					Laurisilva of Madeira	Portugal	127.85	127.85	100.00
					Garajonay National Park	Spain	65.11	65.11	100.00
					Western Caucasus	Russian Federation	2,904.16	2,904.16	100.00
					Sinharaja Forest Reserve	Sri Lanka	95.81	95.81	100.00
					Nanda Devi National Park	India	22.91	815.34	2.81
					Sagarmatha National Park	Nepal	10.43	1,125.77	0.93
					Three Parallel Rivers of Yunnan Protected Areas	China	4,116.57	21,297.69	19.33
					Manas Wildlife Sanctuary		108.83	561.47	19.38
					Kaziranga National Park	India	317.27	317.27	100.00
					Manas Wildlife Sanctuary		452.64	561.47	80.62
					Jiuzhaigou Valley Scenic and Historic Interest	China	352.67	611.82	57.64
					Mount Emei and Leshan Giant Buddha		4.79	379.56	1.26

138	West Sichuan mountains	Urgent	1	2	Huanglong Scenic and Historic Interest Area		151.30	151.30	100.00
139	Yunnan Mountains	Urgent	1	2	Jiuzhaigou Valley Scenic and Historic Interest		259.15	611.82	42.36
140	Chinese subtropical forests	Critical	1	3	Three Parallel Rivers of Yunnan Protected Areas		4,250.18	21,297.69	19.96
141	South-east Chinese mountains	Critical	1	3	Mount Emei and Leshan Giant Buddha		216.65	379.56	57.08
143	Annamese lowlands	Critical	1	3	Mount Huangshan		205.10	379.56	54.04
148	Nansei Shoto	Critical	1	3	Mount Wuyi		1,147.69	1,147.69	100.00
156	Palawan	Urgent	2	2	Phong Nha-Ke Bang National Park	Vietnam	711.21	895.94	79.38
157	Bornean mountains	Urgent	3	1	Yakushima	Japan	459.96	493.19	93.26
157	Bornean mountains	Urgent	3	1	Puerto-Princesa Subterranean River National Park	Philippines	54.27	54.27	100.00
161	Javan coastal zone	High	1	1	Kinabalu Park	Malaysia	729.13	756.73	96.35
162	Northern Nusa Tenggara	High	1	1	The Gunung Mulu National Park		344.78	535.34	64.40
178	Central Papuan mountains	Urgent	3	1	Ujung Kulon National Park		11.26	651.23	1.73
179	South Papuan lowlands	High	1	1	Komodo National Park		523.45	1,785.31	29.32
181	Cape York	Critical	2	3	Lorentz National Park	Indonesia	7,185.86	15,972.60	44.99
182	Queensland wet tropics	Urgent	3	1	Lorentz National Park		8,699.37	15,972.60	54.46
183	Eastern Australia	Critical	3	2	Great Barrier Reef		596.95	339,462.65	0.18
184	South-east Australia	Critical	3	2	Great Barrier Reef		104.55	339,462.65	0.03
185	Tasmania	Urgent	2	2	Wet Tropics of Queensland		6,862.68	7,026.90	97.66
187	North-west Australia	Urgent	3	1	Central Eastern Australian Rainforest		2,376.25	2,376.25	100.00
199	Rennel and Bellona	High	1	1	Fraser Island	Australia	684.62	2,399.74	28.53
204	Lord Howe Island	Critical	2	3	The Greater Blue Mountains Area		10,347.52	10,347.52	100.00
					Australian Fossil Mammal Sites		1.71	111.77	1.53
					Willandra Lakes Region		1,312.99	2,630.12	49.92
					Tasmanian Wilderness		14,631.85	15,044.70	97.26
					Kakadu National Park		18,790.31	18,820.81	99.84
					Purnululu National Park		1,735.00	2,400.75	72.27
					East Rennell	Solomon Islands	306.28	832.54	36.79
					Lord Howe Island Group	Australia	12.74	15.06	84.62

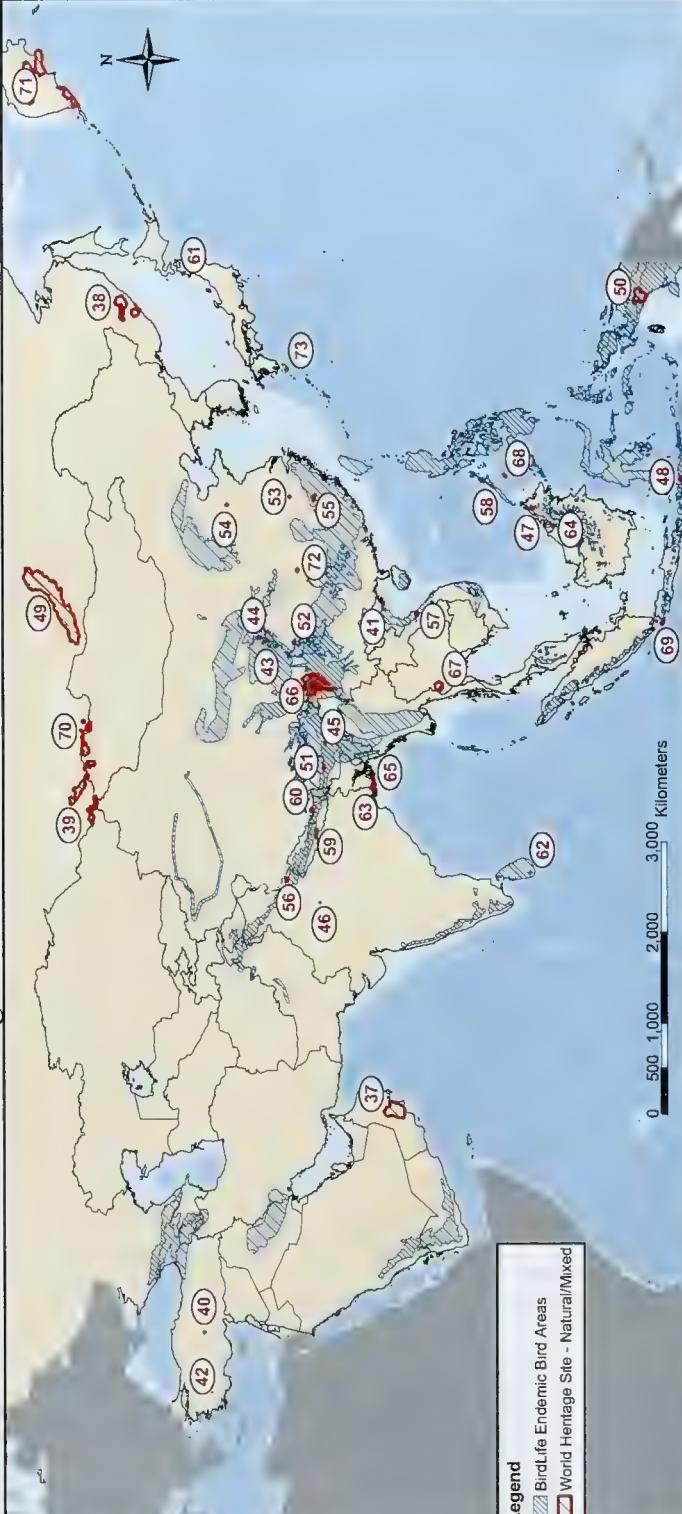
206	North Island of New Zealand	Critical	1	3	Tongariro National Park	683.76	683.76	100.00
207	South Island of New Zealand	Urgent	1	2	Te Wahipounamu-South West New Zealand	22,516.57	25,159.31	89.50
208	Auckland Islands	High	1	1	New Zealand Sub-Antarctic Islands	474.16	13,867.42	3.42
215	Henderson Island	Urgent	1	2	Henderson Island	UK	20.80	41.19
218	Hawaii	Critical	3	3	Hawaii Volcanoes National Park	USA	705.70	98.42

Table 23: Critical EBAs without World Heritage Sites

EBA Code	EBA Name	Country
3	Guadalupe Island	Mexico
4	Socorro Island	Mexico
6	Sierra Madre Occidental and trans-Mexican range	Mexico
9	Sierra Madre del Sur	Mexico
12	Southern Sierra Madre Oriental	Mexico
13	Los Tuxtlas and Uxpanapa	Mexico
27	Jamaica	Jamaica
32	Caripe-Paria region	Venezuela
37	Nechí lowlands	Colombia
38	Columbian East Andes	Colombia/Venezuela
40	Colombian inter-Andean slopes	Colombia
42	Northern Central Andes	Colombia/Ecuador
59	Juan Fernandez Islands	Chile
70	North-east Brazilian caatinga	Brazil
71	Atlantic slope of Alagoas and Pernambuco	Brazil
74	Deciduous forests of Minas Gerais and Goias	Brazil
77	Argentine Mesopotamian Grasslands	Argentina/Brazil/Uruguay
82	São Tomé	São Tomé Príncipe
86	Cameroon mountains	Cameroon/Equatorial Guinea/Nigeria
87	Western Angola	Angola/Namibia
94	East Malagasy wet forests	Madagascar
95	East Malagasy wetlands	Madagascar
96	West Malagasy wetlands	Madagascar
98	Comoro Islands	France
102	Mauritius	Mauritius
103	Rodrigues	Mauritius
112	Central Somali coast	Somalia
113	Jubba and Shabeelle valleys	Ethiopia/Kenya/Somalia
114	South Ethiopian highlands	Ethiopia
116	North Somali mountains	Somalia
142	Hainan	China
144	South Vietnamese lowlands	Viet Nam
147	Ogasawara Islands	Japan
150	Mindoro	Philippines
151	Luzon	Philippines
152	Negros and Panay	Philippines
153	Cebu	Philippines
154	Mindanao and the Eastern Visayas	Philippines
155	Sulu archipelago	Philippines
160	Java and Bali forests	Indonesia
167	Sangihe and Talaud	Indonesia
186	South-west Australia	Australia
192	East Caroline Islands	Micronesia
198	Solomon group	Papua New Guinea
205	Norfolk Island	Australia
209	Chatham Islands	New Zealand
211	Rimatara	France

212	Marquesas Islands	France
214	Tuamotu archipelago	France
216	Laysan Island	USA
217	Central Hawaiian Islands	USA

Distribution of World Heritage Sites & BirdLife International Endemic Bird Areas in Asia



World Heritage Sites

37. Arabian Oryx Sanctuary
38. Central Sikhote-Alin Golden Mountains of Altai
39. Golden Mountains of Altai
40. Goreme National Park and the Rock Sites of Cappadocia
41. Ha Long Bay
42. Hierapolis - Pamukkale
43. Huanglong Scenic and Historic Interest Area
44. Jiuzhaigou Valley Scenic and Historic Interest Area
45. Kaziranga National Park
46. Keoladeo National Park
47. Khinabluu Park
48. Komodo National Park
49. Lake Baikal
50. Lorenz National Park
51. Manas Wildlife Sanctuary
52. Mount Emei and Leshan Giant Buddha
53. Mount Huangshan
54. Mount Taishan
55. Mount Wuyi
56. Nanda Devi National Park
57. Phong Nha - Ke Bang National Park
58. Puerto - Princessa Subterranean River National Park
59. Royal Chitwan National Park
60. Sagarmatha National Park
61. Shrikhandi - Sanchi
62. Sihraraja Forest Reserve
63. Sundarbans National Park
64. The Gunung Muhi National Park
65. The Sundarbans
66. Three Parallel Rivers of Yunnan Protected Areas
67. Thung Yai - Huai Kha Keng Wildlife Sanctuaries
68. Tubbataha Reef Marine Park
69. Ujung Kulon National Park and Krakatoa National Reserve
- 70.Uvs Nuur Basin (Mongolia & Russian Fed.)
71. Volcanoes of Kamchatka
72. Wulanhuan Scenic and Historic Interest Area
73. Yakushima

Geographic Projection
Compiled by M. Mason
Date printed: May 2004
Source: BirdLife International (2004) originally published in
Stattersfield, A., Crosby, M. J., Long, A. J. and Wege, D. C.
(1998) Endemic bird areas of the world: priorities
for bird conservation. Cambridge, UK: BirdLife International
(BirdLife Conservation Series 7) & UNEP-WCMC WDPA V16.1

Map 25

World Heritage Sites & BirdLife International Endemic Bird Areas in Africa



World Heritage Sites

1. Ar and Tchad Natural Reserves
2. Aldabra Atoll
3. Banc d'Arguin National Park
4. Bwindi Impenetrable National Park
5. Cliffs of Bandiagara (Land of the Dogons)
6. Comoé National Park
7. Djoudj National Bird Sanctuary
8. Garamba National Park
10. Gough Island Wildlife Reserve
11. Greater St Lucia Wetland Park
12. Ichkeul National Park
13. Kahuzi-Biega National Park
14. Kilimanjaro National Park
15. Lake Malawi National Park
16. Lake Turkana National Parks
17. Mana Pools National Park, Sapi and Chewore Safari Areas
18. Mount Kenya National Park/Forest
19. Mount Nimba Reserves
20. Ngorongoro Conservation Area
21. Niokolo-Koba National Park
22. Okapi Faunal Reserve
23. Okhahlamba - Drakensberg Park
24. Parc National de Manovo - Gouraud - St Floris
25. Rwenzori Mountains National Park
26. Salonga National Park
27. Selous Game Reserve
28. Serengeti National Park
29. Simen National Park
30. Ta National Park
31. Tassili N'Ajjer
32. Tsingy de Bemaraha Strict Nature Reserve
33. Vallée de Mai Nature Reserve
34. Victoria Falls/Mosi-oa-Tunya
35. Virunga National Park
36. W' National Park

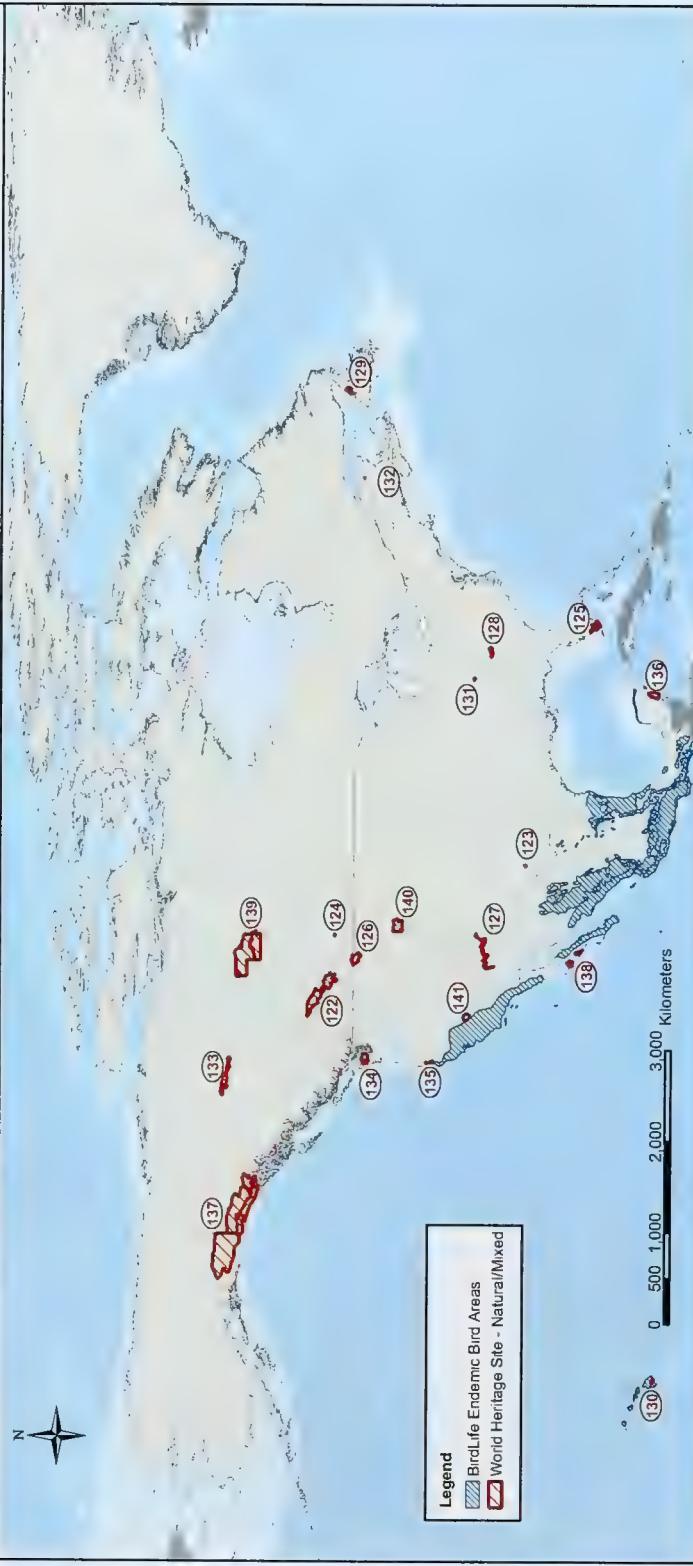
Geographic Projection

Compiled by: M. Mason
Date printed: May 2004

Source: BirdLife International (2004) originally published in Stattersfield, A., Crosby, M.J., Long, A.J. and Wege, D.C. (1998) Endemic bird areas of the world: priorities for bird conservation. Cambridge, UK: BirdLife International (BirdLife Conservation Series 7) & UNEP-WCMC WDPA V 6.1

Map 26

World Heritage Sites & BirdLife International Endemic Bird Areas in North America



World Heritage Sites

- 122. Canadian Rocky Mountain Parks
- 123. Carlsbad Caverns
- 124. Dinosaur Provincial Park
- 125. Everglades National Park
- 126. Glacier and Waterton Lakes National Park
- 127. Grand Canyon National Park
- 128. Great Smoky Mountains National Park
- 129. Gros Morne National Park
- 130. Hawaii Volcanoes National Park
- 131. Mammoth Cave National Park
- 132. Miguasha Park
- 133. Nahanni National Park
- 134. Olympic National Park
- 135. Redwood National Park
- 136. Sian Ka'an
- 137. Taisheshin - Aiseki/Kulanai/Wrangell - St Elias/Glacier Bay
- 138. Whale Sanctuary of El Vizcaino
- 139. Wood Buffalo National Park
- 140. Yellowstone
- 141. Yosemite National Park

Geographic Projection

Compiled by: M. Mason
Date printed: May 2004

Source: BirdLife International (2004) originally published in
Stattersfield, A., Crosby, M. J., Long, A., and Wege, D.C.
(1998) Endemic bird areas of the world: priorities
for bird conservation. Cambridge, UK: BirdLife International,
(BirdLife Conservation Series 7) & UNEP-WCMC (WCPA) v.6.1

Map 27

World Heritage Sites & BirdLife International Endemic Bird Areas in South America



0 500 1,000 2,000 3,000 Kilometers



World Heritage Sites

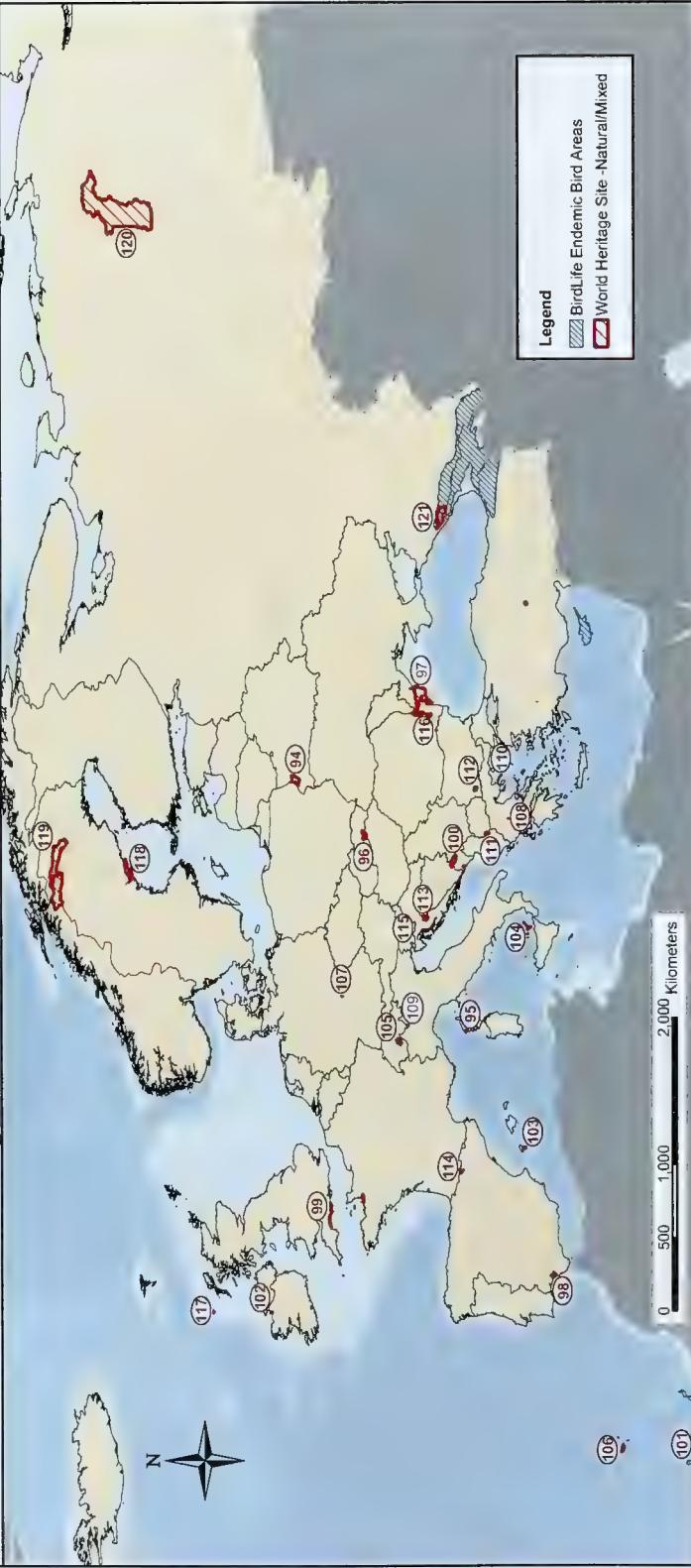
- 142. Alejandro de Humboldt National Park
- 143. Área de Conservación Guanacaste
- 144. Belize Barrier Reef Reserve System
- 145. Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves
- 146. Canaima National Park
- 147. Central Amazon Conservation Complex
- 148. Central Suriname Nature Reserve
- 149. Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks
- 150. Cocos Island National Park
- 151. Darién National Park
- 152. Desembarco del Granma National Park
- 153. Discovery Coast Atlantic Forest Reserves
- 154. Galápagos Islands
- 155. Historic Sanctuary of Machu Picchu
- 156. Huascarán National Park
- 157. Iguazú National Park
- 158. Iguaçu National Park
- 159. Ischigualasto - Talampaya Natural Parks
- 160. Los Glaciares
- 161. Los Katios National Park
- 162. Manu National Park
- 163. Môme Trois Pitons National Park
- 164. Noel Kempff Mercado National Park
- 165. Pantanal Conservation Complex
- 166. Península Valdés
- 167. Rio Abiseo National Park
- 168. Río Plátano Biosphere Reserve
- 169. Sangay National Park
- 170. Southeast Atlantic Forest Reserves
- 171. Taimaná Range - La Amistad Reserves
- 172. Tikal National Park

Geographic Projection
Compiled by: M. Mason
Date printed: May 2004

Source: BirdLife International (2004) originally published in
Stattersfield, A., Crosby, M. J., Long, A.J. and Wege, D.C.
(1999). Endemic bird areas of the world: priorities
for bird conservation. Cambridge, UK: BirdLife International
(BirdLife Conservation Series 7) & UNEP-WCMC WDPA V.6.1

Map 28

World Heritage Sites & BirdLife International Endemic Bird Areas in Europe



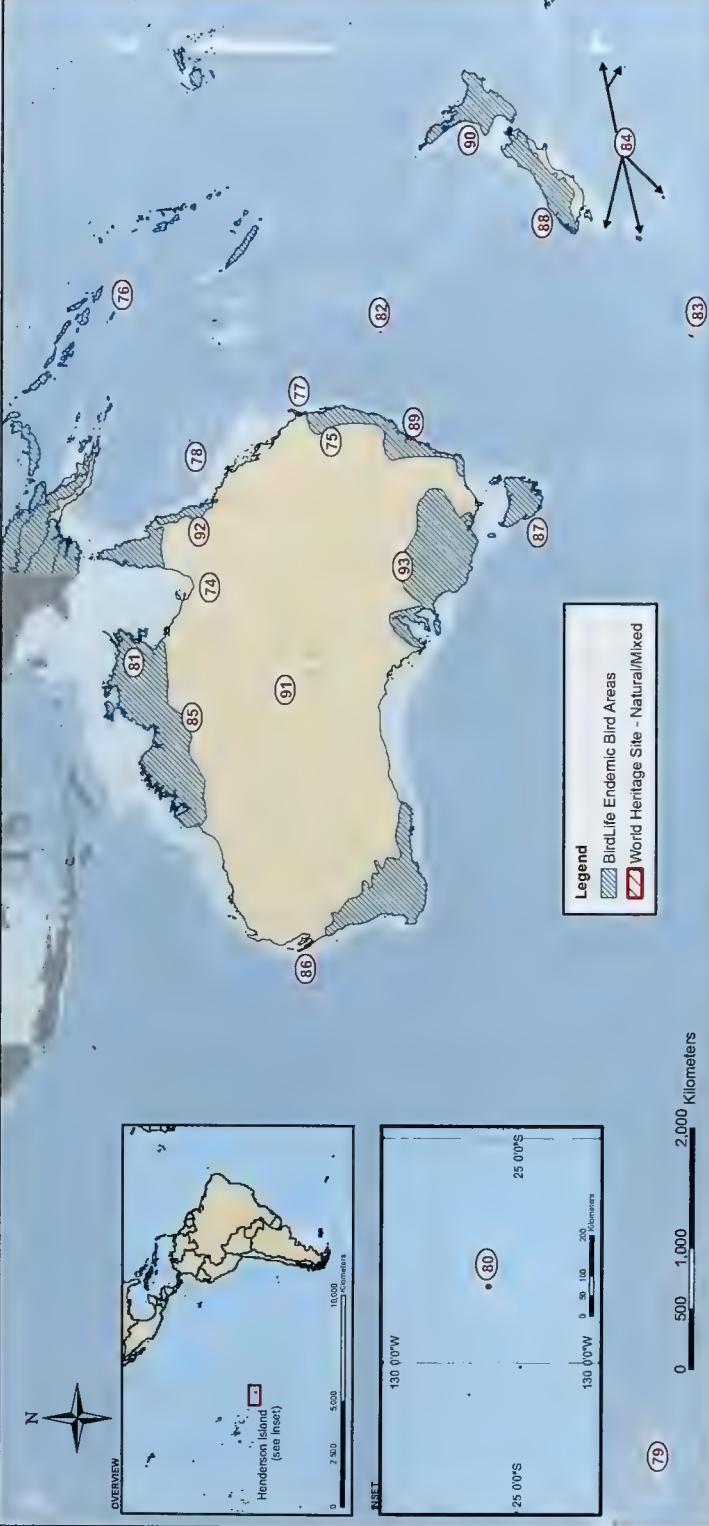
World Heritage Sites

94. Belovezhskaya Pushcha / Białowieża National Park (Belarus and Poland)
95. Cape Ghirota, Cape Porto & Scandola Nature Reserves in Corsica
96. Caves of Aggtelek and Slovák Karst (Hungary and Slovakia)
97. Danube Delta
98. Dōraana National Park
99. Dorset and East Devon Coast
100. Dumitor National Park
101. Garajonay National Park
102. Giant's Causeway and Causeway Coast
103. Ibiza, Biodiversity and Culture
104. Isole Eolie (Aeolian Islands)
105. Jungfrau - Aletsch - Bietschhorn
106. Laurisilva of Madeira
107. Messel Pit Fossil Site
108. Meteora
109. Monte San Giorgio
110. Mount Athos
111. Ohrid Region with its Cultural/Historical Aspect and its Natural Environment
112. Pinn National Park
113. Pilvike Lakes National Park
114. Pyrénées - Mont Perdu (France and Spain)
115. Skocjan Caves
116. Srebarna Nature Reserve
117. St. Kilda
118. The High Coast
119. The Lapponian Area
120. Virgin Komi Forests
121. Western Caucasus

Geographic Projection
Compiled by N. Mason
Date printed May 2004
Source: BirdLife International (2004) originally published in
Sauerfeldt, A., Crosby, M. J., Long, A. J. and Wege, D. C.
(1998) Endemic bird areas of the world: priorities
for bird conservation. Cambridge, UK: BirdLife International
(BirdLife Conservation Series 7) & JNHP-WCMC WDPA v 6.1

Map 29

World Heritage Sites & BirdLife International Endemic Bird Areas in Oceania/Australasia



World Heritage Sites

- 74. Australian Fossil Mammal Sites (Riversleigh / Naracoorte)
- 75. Central Eastern Australian Rainforest
- 76. East Rennell
- 77. Fraser Island
- 78. Great Barrier Reef
- 79. Heard and McDonald Islands
- 80. Henderson Island
- 81. Kakadu National Park
- 82. Lord Howe Island Group
- 83. Macquarie Island
- 84. New Zealand Sub-Antarctic Islands
- 85. Purnululu National Park
- 86. Shark Bay Western Australia
- 87. Tasmanian Wilderness
- 88. Te Wahipounamu - South West New Zealand
- 89. The Greater Blue Mountains Area
- 90. Tongariro National Park
- 91. Uluru - Kata Tjuta National Park
- 92. Wet Tropics of Queensland
- 93. Willandra Lakes Region

Plate Carrée Projection
Compiled by M. Mason
Date printed: May 2004
Source: BirdLife International (2004), originally published in
Stanisfeld, A., Crosby, M. J., Long, A. J. and Wege, D.C.
(1998) Endemic bird areas of the world: priorities
for bird conservation. Cambridge, UK: BirdLife International
(BirdLife Conservation Series 7) & UNEP-WCMC WSPA V 6.1

Map 30

4.3 Centres of Plant Diversity

In the 1990s, concern about the rapid loss and degeneration of natural ecosystems and the urgent need to highlight those areas of prime botanical importance - botanical hotspots - was the impetus for an IUCN/WWF initiative to identify Centres of Plant Diversity (CPD). The outcome of this collaboration was the identification of almost 250 priority sites for the global conservation of higher plants, recorded in *Centres of Plant Diversity: A Guide and Strategy for their Conservation* (WWF and IUCN, 1994-1995).

CPDs are concerned with first order sites that are of global botanical importance. Such areas must either have high species diversity, even if the number of species is not accurately known, or contain a large number of endemic species, or both. CPDs are also likely to be:

- important genepools of plants of known value to humans or that are potentially useful;
- sites with a diverse range of habitat types;
- sites with a significant proportion of species adapted to special edaphic conditions; and/or
- threatened or under imminent threat of large-scale devastation.

Some of the 250 sites are subdivided into 14 or more geographically separate constituent parts, for example, the Montane Flora of Peninsular Malaysia. Information provided includes patterns of plant distributions, threats and conservation efforts. These sites were identified using factors such as floristic statistics, with inputs from experts familiar with particular geographical areas.

According to the CPD GIS datasets, 74 WH Sites (43%) overlap with 57 Centres of Plant Diversity (Table 24 and Maps 31-36)). The most comprehensive CPD, in terms of World Heritage, is Af81 - Afroalpine Region (East and North-east Africa) which has five WH Sites within it: Kilimanjaro, Mt Kenya, Rwenzori, Simien and Virunga. There are a total of 249 named CPDs with polygon areas and 33 CPD points without areas in the GIS dataset, giving a total of 282 CPDs. Thus overall, 20.2% of CPDs for which GIS data are available occur in WH Sites while 79.8% do not. CPDs without WH Sites are listed in Table 25.

Table 24: World Heritage Sites in Centres of Plant Diversity

CPD Code	Centre of Plant Diversity	World Heritage Site	Country	Area of Wh Site in CPD (km ²)
Af11	Forest zone, River Djá region	Dja Faunal Reserve	Cameroon	4,950.46
Af2	Tai National Park	Tai National Park	Côte d'Ivoire	758.96
Af25	Bwindi (Impenetrable) Forest	Bwindi Impenetrable National Park	Uganda	160.46
Af30	Salonga National Park	Salonga National Park	DR Congo	29,782.46
Af4	Mont Nimba	Mount Nimba Strict Nature Reserve	Côte d'Ivoire/Guinea	67.21
Af49	Garamba National Park	Garamba National Park	DR Congo	4,441.74
Af59	Maputaland-Pondoland Region	Greater St Lucia Wetland Park	South Africa	1,719.98
Af62	Mount Kenya	Ukhahlamba / Drakensberg Park	South Africa	460.15
		Mount Kenya National Park/Natural Forest	Kenya	1,267.34
		Kilimanjaro National Park	UR Tanzania	135.25
Af81	Afroalpine Region (East and North-east Africa)	Mount Kenya National Park/Natural Forest	Kenya	37.70
		Rwenzori Mountains National Park	Uganda	366.58
		Simien National Park	Ethiopia	0.39
		Virunga National Park	DR Congo	205.57
Af82	Drakensberg Alpine Region	Ukhahlamba / Drakensberg Park	South Africa	1,822.22
AO3	Madeira	Laurisilva of Madeira	Portugal	110,272.01
Au10	Wet Tropics of Queensland	Great Barrier Reef	Australia	0.08
		Wet Tropics of Queensland	Australia	3,811.88
Au17	Subantarctic Islands	Macquarie Island	Australia	127.30
		New Zealand Sub-Antarctic Islands	Australia	690.40
Au2	Border Ranges	Central Eastern Rainforest Reserves (Australia)	Australia	1,317.95
Au3	Central Australian Mountain Ranges	Uluru-Kata Tjuta National Park	Australia	157.39
Au4	Kakadu-Alligator Rivers Region	Kakadu National Park	Australia	13,980.23
Au5	Lord Howe	Lord Howe Island Group	Australia	11.32
Au7	South-West Botanical Province	Shark Bay, Western Australia	Australia	2,558.64
Au8	Sydney Sandstone Region	The Greater Blue Mountains Area	Australia	4,718.54

Au9	Western Tasmania Wilderness	Tasmanian Wilderness	Australia	13,383.54	
CA1	Altai-Sayan	Golden Mountains of Altai	Russian Federation	17,003.81	
CA2	Caucasus	Lake Baikal	Russian Federation	2,533.96	
CA5	Primorye	Uvs Nuur Basin	Russian Fed/Mongolia	3,145.62	
EA26	High Mt & Deep Gorge Reg.- Gaoligong Mt/Nu Jiang R	Western Caucasus	Russian Federation	3,595.36	
EA40	Hengduan Mountains, Min Jiang River region	Central Sikhote-Alin	Russian Federation	15,489.86	
EA50	Yakushima	Three Parallel Rivers of Yunnan Protected Areas	China	2,836.20	
EA59	Thung Yai-Huai Kha Khaeng World Heritage Site	Huanglong Scenic and Historic Interest Area	China	151.30	
Eu10	Pyrenees	Jiuzhaigou Valley Scenic and Historic Interest Area	China	436.21	
Eu11	Alps	Yakushima	Japan	488.04	
Eu14	Balkan and Rhodope Massifs	Thungyai - Huai Kha Khaeng Wildlife Sanctuaries	Thailand	4,102.13	
IS13	Sinharaja	Pyrénees - Mont Perdu	France/Spain	257.80	
IS2	North Myanmar	Jungfrau-Aletsch-Bietschhorn	Switzerland	537.68	
IS4	Tenasserim	Monte San Georgio	Monte San Georgio	23.91	
IS9	Nanda Devi	Pinir National Park	Bulgaria	295.88	
MA20	Darien Region and Darien National Park	Sinharaja Forest Reserve	Sri Lanka	45.81	
MA3	Talamanca Mts of SE Costa Rica and NW Panama Inter	Three Parallel Rivers of Yunnan Protected Areas	China	93.58	
MA4	Peten Region and Maya Biosphere Reserve	Three Parallel Rivers of Yunnan Protected Areas	China	10.89	
MA6	NE Honduras and Rio Platano Biosphere Reserve	Nanda Devi National Park	India	602.92	
MA9	Central Region of Baja California Peninsula	Darién National Park	Panama	4,926.55	
NA16	California Floristic Province	Los Katíos National Park	Colombia	2.02	
		Talamanca Range-La Amistad Reserves/La Amistad National Park	Costa Rica/Panama	1,616.23	
		Peten Region and Maya Biosphere Reserve	Tikal National Park	Guatemala	4,719.35
		Rio Platano Biosphere Reserve	Honduras	1,477.94	
		Whale Sanctuary of El Vizcaíno	Mexico	805.43	
		Yosemite National Park	USA	3,053.26	

NA16c	Klamath-Siskiyou Region	Redwood National Park	USA	419.05
SA12	Paramo and Andean Forests of Sangay National Park	Sangay National Park	Ecuador	3,580.69
SA14	Upper Negro River Region	Central Amazon Conservation Complex	Brazil	1,520.24
SA19	Peruvian Puna	Historic Sanctuary of Machu Picchu Huascarán National Park	Peru	0.98 2,892.83
SA2	Pantepui Region	Manu National Park Rio Abiseo National Park	Venezuela	376.62 1,037.83
SA21	Eastern slopes of the Peruvian Andes	Canaíma National Park Historic Sanctuary of Machu Picchu Manu National Park	Peru	30,428.63 370.61 1,960.99
SA22	Manu National Park	Rio Abiseo National Park Manu National Park	Peru	1,386.63 11,238.60
SA31	Gran Chaco Region	Ischigualasto - Talampaya Natural Parks	Argentina	391.08
SA35	Atlantic Moist Forest of Southern Bahia	Discovery Coast Atlantic Forest Reserves	Brazil	12,656.91
SA36	Tabuleiro Forest of Northern Espírito Santo	Discovery Coast Atlantic Forest Reserves	Brazil	?
SA40	Jureira-Itatins Ecological Station	Atlantic Forest Southeast Reserves	Brazil	959.22
SEA24	Kinabalu Park	Kinabalu Park	Malaysia	511.56
SEA33	Gunung Mulu NP/Labi Hills/Batu Patam/Sungei Ingei	Gunung Mulu National Park	Philippines	450.14
SEA60	Palawan	Puerto-Princesa Subterranean River National Park	Philippines	50.66
SEA69	Gunung Lorrentz	Lorentz National Park	Indonesia	13,817.23
SWA16	Southwest Anatolia	Hierapolis-Pamukkale	Turkey	0.14
PO7	Galapagos Islands	Galápagos Islands	Ecuador	?

Table 25: Centres of Plant Diversity not occurring in World Heritage Sites

CPD Code	Centre of Plant Diversity	Area of CPD (km²)
Af12	Korup National Park	535.55
Af13	Mount Cameroon	415.26
Af16	Mayombe	2,865.66
Af18	Cristal Mountains	10,380.33
Af24	Oban Hills and Cross River National Park	692.05
Af29	Maiko National Park	10,358.09
Af33	Mahle-Karobwa Hills	1,039.34
Af35	Kundelungu	2,771.56
Af37	Upemba National Park	11,741.13
Af39	Zambezi source area	1,973.88
Af42	Cal Madow	15,164.77
Af44	Hobyo/Obbie area	9,084.50
Af50	The Kaokoveld	200,653.82
Af51	Western Cape Domain (Succulent Karoo)	141,905.40
Af53	Cape Floristic Region	85,618.78
Af57	Rondo Plateau	1,104.04
Af64	Mount Mulanje	595.27
Af7	Sapo National Park	435.63
Af71	East Usambaras Mountains	1,685.71
Af84	High Atlas	15,608.57
Au1	Australian Alps	49,504.52
Au14	Northland	18,412.29
Au15	North-west Nelson	8,637.23
Au16	Chatham Islands	806.23
Au6	North Kimberley Region	108,203.37
CA3	Mountains of Middle Asia	654,256.88
CA4	Chukotskiy Peninsula	435,412.41
EA1	Changbai Mountain region	45,276.10
EA13	Nanling Mountain Range	72,894.86
EA27	Tropical forests of Hainan	15,880.32
EA29	Xishuangbanna region	20,534.49
EA31	Limestone region, south-west Zhuang Autonomous Reg	8,527.50
EA41	Kenting National Park	303.81
EA44	Mount Halla	274.90
EA49	Mount Hakusan	1,282.24
EA53	Doi Chiang Dao Wildlife Sanctuary	809.57
EA55	Doi Suthep-pui National Park	194.28
EA57	Khao Yai National Park	808.27
EA6	Taibai Mountain region	5,956.84
EA62	Bach Ma-Hai Van National Park	639.13
EA63	Cat Tien Biosphere Reserve	900.23
EA64	Cuc Phuong National Park	648.85
EA65	Langbian-Dalat Highland	809.39
EA66	Yok Don Nature Reserve	1,335.16
Eu16	Mountains of Southern and Central Greece	61,546.47
Eu17	Crete	38,844.11
Eu18	Troodos Mountains	2,598.02
Eu21	South Crimean Mountains and Novorossia	6,600.15

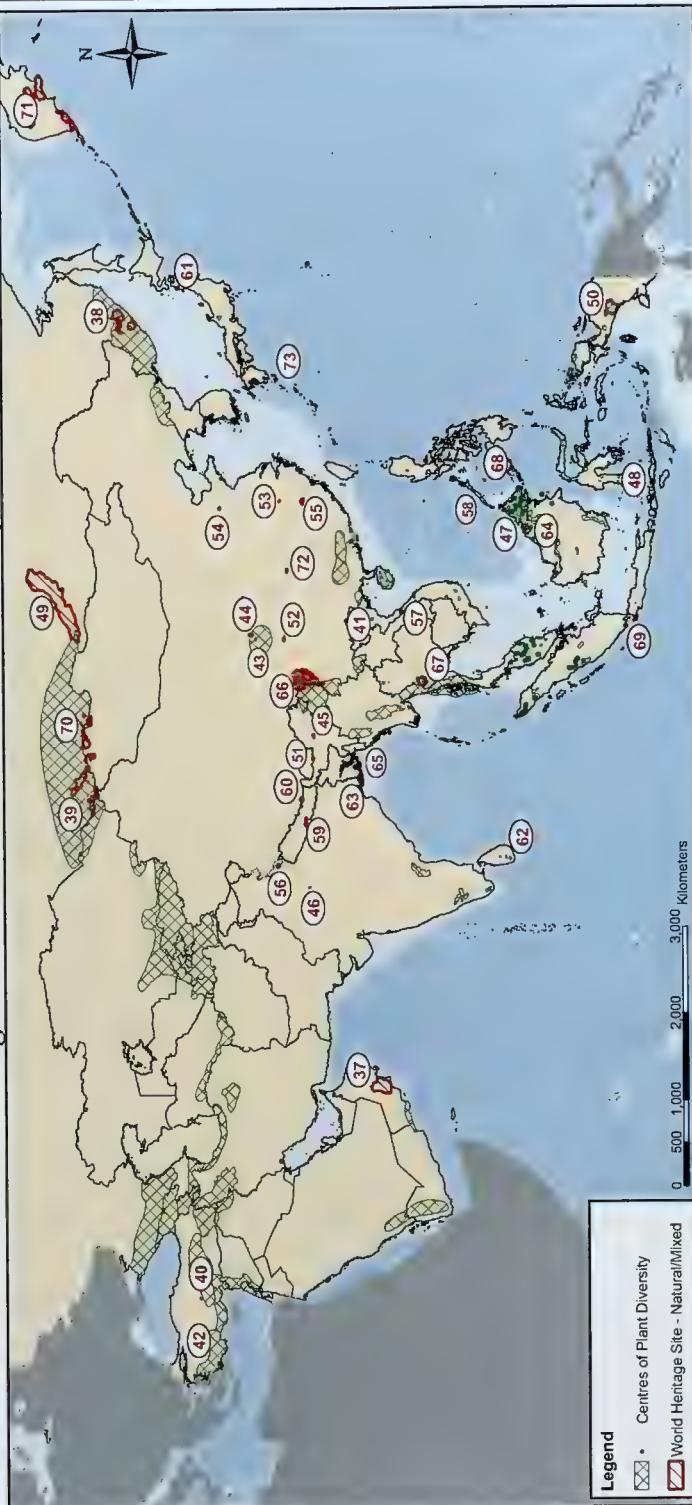
Eu4	Baetic and Sub-Baetic Mountains	55,859.70
Eu6	Sierra de Gredos and Sierra de Guadarrama	23,039.85
Eu7	Mountains of Aragon	9,278.75
IS1	Bago Yoma	37,730.01
IS10	Nilgiri Biosphere Reserve	11,493.61
IS11	Knuckles	248.85
IS12	Peak Wilderness and Horton Plains	380.18
IS3	Rongklang Range	22,258.65
IS5	Agastyamalai Hills	2,277.16
IS6	Andaman and Nicobar Islands	7,510.66
IS7	Nallamalais	14,756.90
IS8	Namdapha National Park	11,352.91
MA1	Braulio Carrillo-La Selva Region	672.11
MA10	Cuatro Cienagas Region	416.75
MA11	Apachian-Madrean Region	88,812.16
MA12	Lacandon Rain Forest/Montes Azules Biosphere Reser	2,987.66
MA13	Pacific Lowlands/Jalisco/Chamela Biol Stn/Cumbres	151.53
MA14	Sierra de Juarez, Oaxaca	2,510.65
MA15	Sierra de Mantantlan Biosphere Reserve	1,186.39
MA16	Tehuacan-Cuicatlan Region	7,888.43
MA17	Upper Mezquital River Region, Sierra Madre Occiden	8,031.72
MA18	Uxpanapa-Chimalapa Region	7,159.29
MA19	Cerro Azul-Cerro Jefe (in Chagres National Park)	1,924.24
MA2	Osa Peninsula and Corcovado National Park	478.35
MA5	Sierra de las Minas Region and Biosphere Reserve	228.47
MA8	Canyon of the Zopilote Region	6,711.82
NA29	Central Highlands, Florida	42,769.77
NA32	Edwards Plateau	135,314.72
SA1	Saul Region	1,149.56
SA10	Gran Sumaco and Upper Napo Region	5,539.30
SA11	Yasuni National Park and Waorani Ethnic Reserve	8,636.49
SA13	Chiribiquete-Araracuara-Cahuinari Region	69,813.50
SA16	Iquitos Region	105,092.42
SA17	Cerros de Amotape National Park	843.44
SA18	Huancabamba Region	32,739.60
SA20	Peruvian Desert: Lomas Formation	83,723.90
SA23	Tambopata Region	15,703.79
SA24	Apolo-Madidi Region	21,142.15
SA25	Llanos de Mojos	302,884.75
SA26	Atacama Desert	84,085.32
SA27	Mediterranean Region	104,244.45
SA28	Temperate Rain Forest	99,024.38
SA29	Patagonia	467,943.36
SA3	Coastal Cordillera	9,920.16
SA30	Anconquija Region	16,787.07
SA32	South-eastern Santa Cruz	124,685.99
SA33	Mbaracayu Region	1,143.76
SA34	Distrito Federal	9,160.26
SA37	Cabo Frio Region	3,002.24
SA38	Mountain Ridges of Rio de Janeiro	9,208.26
SA39	Semi-deciduous Forests of Southern Brazil	723.25

SA4	Sierra Nevada de Santa Marta	6,201.93
SA5	Choco Region	87,129.40
SA6	Los Nevados National Park	1,818.28
SA7	Central Colombian Massif	3,416.49
SA8	Volcanoes of the Nariñense Plateau	1,627.97
SA9	Moist to Pluvial Forests of Western Ecuador	6,904.33
SEA1	Dindings, Segari Melintang and Larut Hills	267.40
SEA10	Trengganu Hills	423.38
SEA100	Owen Stanley Mountains	12,034.62
SEA101	Varirata and Astrolabe Ranges	1,904.21
SEA102	Safia Savanna	1,677.14
SEA103	Topographers Range	1,494.58
SEA104	Lake Wanum-Red Hill Swamp-Oomsis Ridge	168.55
SEA105	Porgera Peaks	712.32
SEA106	Gogol-Sogeron Headwaters	1,584.22
SEA107	Lower Watut	656.24
SEA109	Willaumez Peninsula-Lake Dakataua	390.95
SEA11	Ulu Belem	265.06
SEA110	Whiteman Range to southern coast of New Britain	9,774.48
SEA111	Nakanai Mountains	5,879.28
SEA112	Mounts Sinewit and Burrunga	1,814.42
SEA113	Hans Meyer Range	2,991.42
SEA114	Southern Namatanai	287.69
SEA115	Schleinitz Range-Lelet Plateau	1,134.90
SEA116	Central Manus-Mount Dremsel	557.20
SEA117	Mount Balbi to southern coast	1,535.24
SEA118	Mount Takuan-Tonolei Harbour	1,714.15
SEA119	D'Entrecasteaux Islands	3,017.30
SEA120	Louisiane Archipelago	98,899.66
SEA13	Batu Apoi Forest Reserve, Ulu Temburong	369.99
SEA15	Bukit Raya, Bukit Baka	1,315.28
SEA16	Gunung Bentuang dan Karimun/Lanjak Entimau/Batang	6,154.81
SEA17	Gunung Palung	393.71
SEA18 (a, k, m)	Limestone flora of Borneo	9,683.57
SEA19	Sungai Kayan-Sungai Mentarang	23,299.76
SEA2	Endau-Rompin State Parks (proposed)	571.54
SEA20	Ulu Sembakung	2,043.91
SEA21	Crocker Range / Mount Trus Madi	4,341.97
SEA22 (a-n)	East Sabah Lowland and Hill Dipterocarp Forest	7,394.88
SEA26	Ulu Long Pasia	372.39
SEA28	Bako	2,643.03
SEA29	Batu Laga, Linau Balui Plateau	785.37
SEA30	Bukit Mersing, Anap, Tatau region	228.54
SEA31	Gunung Gading National Park	83.99
SEA32	Gunong Garahu, Gunong Apeng and Gunong Silantek, Sabal Forest Reserve	250.12
SEA34	Lambir Hills	27.24
SEA35	Mixed dipterocarp forest on humult ultisols on coastal hills	162.47
SEA38	Pulong Tau, Gunung Murud	1,326.89
SEA3a	Limestone flora of Peninsular Malaysia	458.26
SEA4	Montane flora of Peninsula Malaysia	10.82
SEA41	Gunung Leuser National Park (proposed)	6,685.21

SEA42	Kerinci-Seblat	4,127.89
SEA43	S.E. Milne Bay (Cloudy Mountains)	1,255.49
SEA45	Tigapuluh Mountains	2,374.86
SEA46	Dumoga-Bone National Park (proposed)	2,658.53
SEA47	Limestone flora of Sulawesi	9,127.95
SEA48	Ultramafic flora of Sulawesi: Morowali Nature Reserve	1,200.58
SEA4 (a-q)	Montane flora of Peninsular Malaysia	803.78
SEA5	Pulau Tioman	113.13
SEA50	Pegunungan Latimojong	236.00
SEA51	Batanes	208.31
SEA52	Mount Apo	746.90
SEA57	Mt Pulog/Mt Tabayoc	455.63
SEA59	Palanan Wilderness Area	217.75
SEA6	Sedili Kecil Swamp Forest	141.45
SEA61	Sibuyan Island	464.17
SEA64	Gede-Pangrango National Park	77.79
SEA68	Arfak Mountains	633.84
SEA7	South-east Pahang Swamp Forests	563.86
SEA70	Mamberamo-Peg Jayawijaya	16,847.53
SEA71	Waigeo	14,850.89
SEA72	Salawati Utara	434.03
SEA73	Tamrau Utara	1,280.52
SEA74	Tamrau Selatan	1,121.09
SEA75	Peg Wandamen (Wondiwoi)	1,008.21
SEA76	Wagora Kote	116.83
SEA78	Peg Weyland	3,596.99
SEA79	Cyclops	214.34
SEA8	Taman Negara	4,241.51
SEA80	Supiori, Numfor North Biak Island	1,479.11
SEA81	Pulau Yapen	1,227.09
SEA82	Torricelli Mts-Bewani Mts-Prince Alexander Range	13,914.75
SEA83	Star Mts-Telefomin-Strickland Gorge	17,352.94
SEA84	Hunstein Range-Burgers Mts-Schatterburg	5,525.77
SEA85	Kiunga-Palmer River-Victor Emmanuel Range	7,214.97
SEA86	Mt Giluwe-Tari Fap-Doma Peaks	3,325.76
SEA87	Kubor Ranges	1,604.81
SEA88	Adelbert Ranges	2,270.64
SEA89	Bismarck Falls-Mt Wilhelm-Mt Otto-Schrader Range-M	9,704.69
SEA9	Tasek Berah Forest Reserve	1,158.91
SEA90	Finisterre Ranges	6,288.18
SEA91	Huon Penin-Mt Bangeta-Rawlinson Ranges; Cromwell R	3,387.67
SEA92	S Fly Ptf:L Daviumbu-Oriomo-Wassi Kussa-Tonda WMA	18,299.67
SEA94	Tower Limestone Region:Leonard Murray Mts-Darai Hi	5,103.20
SEA95	Gulf-lhu	8,173.37
SEA96	Mount Michael-Okapa-Crater Mountain	2,605.25
SEA98	Menyamya-Aseki- Mt Amungwiwa-Bowutu Mts-Lasanga	6,694.84
SEA99	Milne Bay-Collinwood Bay to southern coast	5,132.50
SWA1	Dhofar Fog Oasis	16,210.95
SWA10	Touran Biosphere Reserve	31,523.54
SWA12	Anti-Taurus Mountains and Upper Euphrates	113,552.54
SWA14	Mountains of SE Turkey, NW Iran and Northern Iraq	158,255.97

SWA15	Isaurian, Lycaonian and Cilician Taurus	37,286.54
SWA17	Levantine Uplands	64,836.21
SWA18	Hyrcanian forests	48,209.45
SWA4	Socotra	3,832.29
SWA5	Highlands of South-western Arabia	94,883.54
??	Gomez Farias Region/El Cielo Biosphere Reserve	1,362.18
??	Norfolk Island	38.61

World Heritage Sites & Centres of Plant Diversity in Asia



World Heritage Sites

- 37. Arabian Oryx Sanctuary
- 38. Central Shitou - Alin
- 39. Golden Mountains of Altai
- 40. Gérme National Park and the Rock Sites of Cappadocia
- 41. Ha Long Bay
- 42. Hierapolis - Pamukkale
- 43. Huanglong Scenic and Historic Interest Area
- 44. Jiuzhaigou Valley Scenic and Historic Interest Area
- 45. Kaziranga National Park
- 46. Keoladeo National Park
- 47. Khunablu Park
- 48. Komodo National Park
- 49. Lake Baikal
- 50. Lorentz National Park
- 51. Manas Wildlife Sanctuary
- 52. Mount Emei and Leshan Giant Buddha
- 53. Mount Huangshan
- 54. Mount Taishan
- 55. Mount Wuyi
- 56. Nanda Devi National Park
- 57. Phong Nha - Ke Bang National Park
- 58. Puerto Princesa Subterranean River National Park
- 59. Royal Chitwan National Park
- 60. Sagarmatha National Park
- 61. Shirakami - Sanchi
- 62. Sundarbans National Park
- 63. Siñhara Forest Reserve
- 64. The Gurung Mulu National Park
- 65. The Sundarbans
- 66. Three Parallel Rivers of Yunnan Protected Areas
- 67. Thung Yai - Huai Kha Keng Wildlife Sanctuaries
- 68. Tubbataha Reef Marine Park
- 69. Ujung Kulon National Park and Krakatoa National Reserve
- 70.Uvs Nuur Basin (Mongolia & Russian Fed.)
- 71. Volcanoes of Kamchatka
- 72. Wulingshan Scenic and Historic Interest Area
- 73. Yakushima

Geographic Projection
Compiled by: M. Mason
Date printed: May 2004
Source: IUCN/WWF/CWCP/WDPA v.6.1
& IUCN CPD Database

Map 31

World Heritage Sites & Centres of Plant Diversity in Africa



World Heritage Sites

1. Ar and Tchad Natural Reserves
2. Aldabra Atoll
3. Banc d'Arguin National Park
4. Bwindi Impenetrable National Park
5. Cliffs of Bandiagara (Land of the Dogons)
6. Comoé National Park
7. Dja Faunal Reserve
8. Djoudj National Bird Sanctuary
9. Garamba National Park
10. Gough Island Wildlife Reserve
11. Greater St Lucia Wetland Park
12. Ichkeul National Park
13. Kahuzi-Biega National Park
14. Kilimanjaro National Park
15. Lake Malawi National Park
16. Lake Turkana National Parks
17. Mana Pools National Park, Sapi and Chewore Safari Areas
18. Mount Kenya National Park/Forest
19. Mount Nimba Reserves
20. Ngorongoro Conservation Area
21. Niokolo-Koba National Park
22. Okapi Faunal Reserve
23. Okhahlamba - Drakensberg Park
24. Parc National de Manovo - Gounda-St Floris
25. Rwenzori Mountains National Park
26. Salonga National Park
27. Selous Game Reserve
28. Serengeti National Park
29. Simen National Park
30. Ta National Park
31. Tassili N'Ajjer
32. Tsingy de Bemaraha Strict Nature Reserve
33. Vallée de Mai Nature Reserve
34. Victoria Falls/Mosi-oa-Tunya
35. Virunga National Park
36. W National Park

Geographic Projection
Compiled by: M. Mason
Date printed: May 2004

Source: UNEP-WCMC WDPA V.6.1
& IUCN CPD Datasets

Map 32

World Heritage Sites & Centres of Plant Diversity in North America



World Heritage Sites

- 122. Canadian Rocky Mountain Parks
- 123. Carlsbad Caverns
- 124. Dinosaur Provincial Park
- 125. Ergaki and Waterton Lakes National Park
- 126. Glacier and Waterton Lakes National Park
- 127. Grand Canyon National Park
- 128. Great Smoky Mountains National Park
- 129. Gros Morne National Park
- 130. Hawaii Volcanoes National Park
- 131. Mammoth Cave National Park
- 132. Miguasina Park
- 133. Nahanni National Park
- 134. Olympic National Park
- 135. Redwood National Park
- 136. Sian Ka'an
- 137. TaishanShni - Alek/Klausen/Wrangell - St Elias/Glacier Bay
- 138. Whales Sanctuary of El Vizcaino
- 139. Wood Buffalo National Park
- 140. Yellowstone
- 141. Yosemite National Park

Geographic Projection
Compiled by: M. Mason
Date printed: May 2004
Source: UNEP-WCMC WDPA v 6.1
& IUCN CPD Datasets

Map 33

World Heritage Sites & Centres of Plant Diversity in South America



World Heritage Sites

- 142. Alejandro de Humboldt National Park
- 143. Área de Conservación Guanacaste
- 144. Belize Barrier Reef Reserve System
- 145. Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves
- 146. Canaima National Park
- 147. Central Amazon Conservation Complex
- 148. Central Suriname Nature Reserve
- 149. Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks
- 150. Cocos Island National Park
- 151. Danan National Park
- 152. Desembarco del Granma National Park
- 153. Discovery Coast Atlantic Forest Reserves
- 154. Galapagos Islands
- 155. Historic Sanctuary of Macchu Picchu
- 156. Huascarán National Park
- 157. Iguazú National Park
- 158. Iguaçu National Park
- 159. Ischigualasto - Talampaya Natural Parks
- 160. Los Glaciares
- 161. Los Katos National Park
- 162. Manu National Park
- 163. Morne Trois Pitons National Park
- 164. Noel Kempff Mercado National Park
- 165. Pantanal Conservation Complex
- 166. Península Valdés
- 167. Rio Abiseo National Park
- 168. Río Plátano Biosphere Reserve
- 169. Sangay National Park
- 170. Southeast Atlantic Forest Reserves
- 171. Talamanca Range - La Amistad Reserves
- 172. Tikal National Park

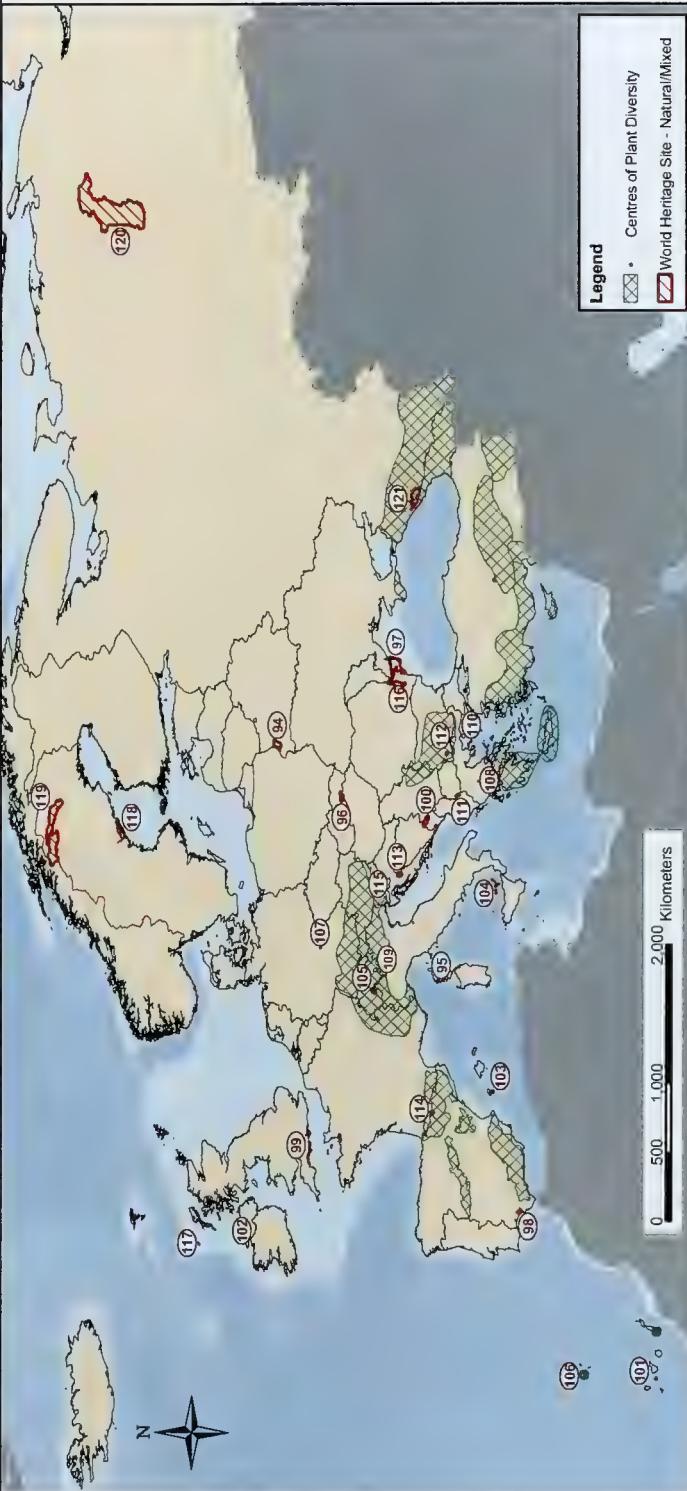
Geographic Projection

Compiled by: M. Mason
Date printed: May 2004

Source: UNEP-WCMC WDPA V 6.1
& IUCN CPD Datasets

Map 34

World Heritage Sites & Centres of Plant Diversity in Europe



World Heritage Sites

- 94. Belovazinskaya Puscha / Bialowieza National Park (Belarus and Poland)
- 95. Cape Giroletta / Cape Porto & Scandola Nature Reserves in Corsica (France)
- 96. Caves of Aggtelek and Slovak Karst (Hungary and Slovakia)
- 97. Danube Delta
- 98. Doñana National Park
- 99. Dorset and East Devon Coast
- 100. Durmitor National Park
- 101. GoraJomay National Park
- 102. Giant's Causeway and Causeway Coast
- 103. Ibiza, Biodiversity and Culture
- 104. Isole Eolie (Aeolian Islands)
- 105. Jungfrau - Alpsch - Bietschhorn
- 106. Laurisilva of Madeira
- 107. Messel Pit Fossil Site
- 108. Meteora
- 109. Monte San Giorgio
- 110. Mount Athos
- 111. Olavid Region with its Cultural/Historical Aspect and its Natural Environment
- 112. Pinn National Park
- 113. Plitvice Lakes National Park
- 114. Pyrenees - Mont Perdu (France and Spain)
- 115. Skocjan Caves
- 116. Srebarna Nature Reserve
- 117. St. Kilda
- 118. The High Coast
- 119. The Lappoman Area
- 120. Virgin Komi Forests
- 121. Western Caucasus

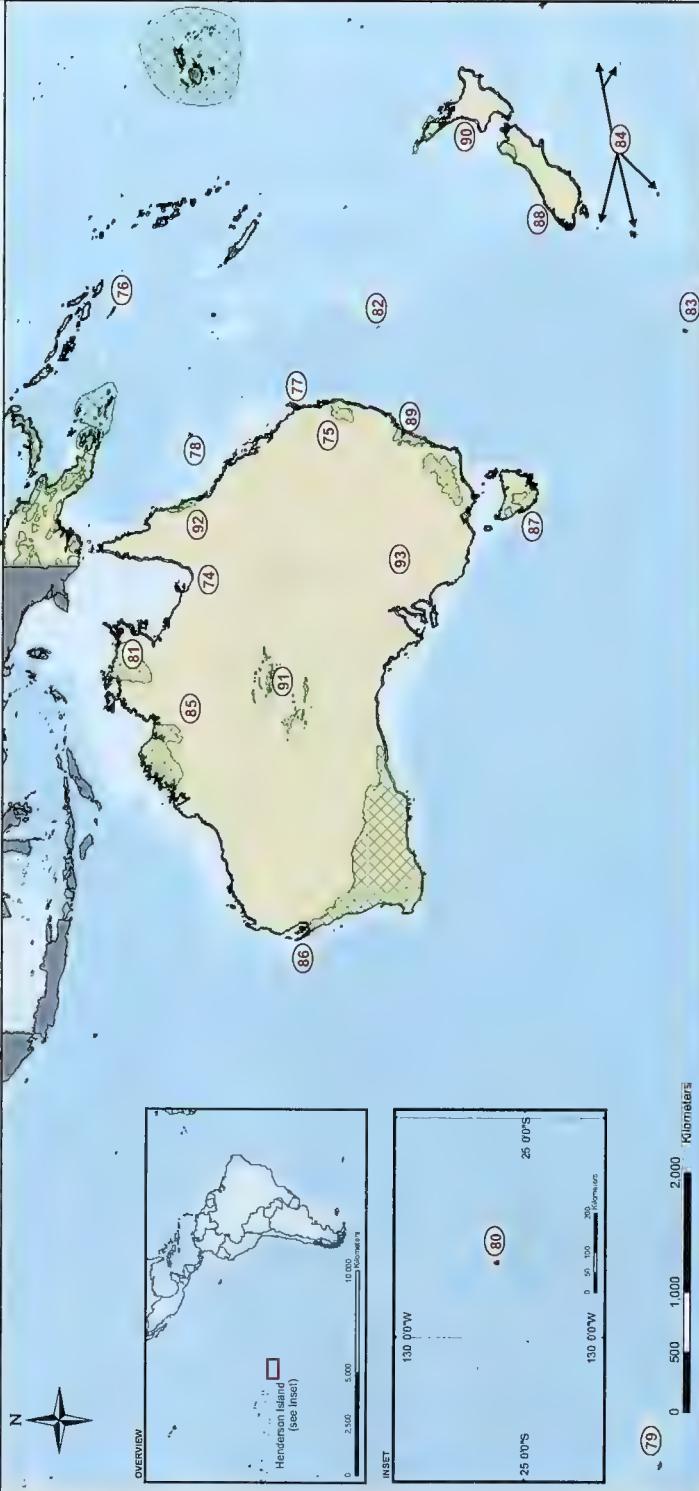
Legend

- Centres of Plant Diversity
- World Heritage Site - Natural/Mixed

Geographic Projection
Compiled by M. Meier
Data printed: May 2004
Source: IUCN CPD Dataset &
UNEP-WCMC WDPA V 6.1 Dataset

Map 35

World Heritage Sites & Centres of Plant Diversity in Oceania/Australasia



World Heritage Sites

- 74. Australian Fossil Mammal Sites (Riversleigh, Naracoorte)
- 75. Central Eastern Australian Rainforest
- 76. East Rennell
- 77. Fraser Island
- 78. Great Barrier Reef
- 79. Heard and McDonald Islands
- 80. Henderson Island
- 81. Kakadu National Park
- 82. Lord Howe Island Group
- 83. Macquarie Island
- 84. New Zealand Sub - Antarctic Islands
- 85. Purnululu National Park
- 86. Shark Bay Western Australia
- 87. Tasmanian Wilderness
- 88. Te Wahipounamu - South West New Zealand
- 89. The Greater Blue Mountains Area
- 90. Tonga Marine National Park
- 91. Uluru - Kata Tjuta National Park
- 92. Wet Tropics of Queensland
- 93. Willandra Lakes Region

Legend

	Centres of Plant Diversity
	World Heritage Site - Natural/Mixed

Plate Carrée Projection
Compiled by: M. Mason
Date printed: May 2004
Source UNEP-WCMC WDPA v 6.1
& IUCN CPD Datasets

Map 36

5. CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The 2003 United List of Protected Areas (Chape *et al.* 2003) recorded over 100,000 designated protected areas covering almost 19 million km² or 3.67% of the Earth's estimated surface area⁴ of 511.16 million km². In terms of international status, the current 172 Natural and Mixed WH Sites represent the 'jewels in the crown' of the global protected area estate. Their importance can be illustrated by the fact that the 149 natural and 23 mixed sites comprise only approximately 0.17% of the number of protected areas in the world, but together cover 1.71 million km² (GIS figures) equivalent to 9.12% of the total area protected, or 0.34% of the total global surface area. Even though this high percentage is skewed by seven sites larger than 50,000 km², it highlights the strategic values and significance of World Heritage at a global scale.

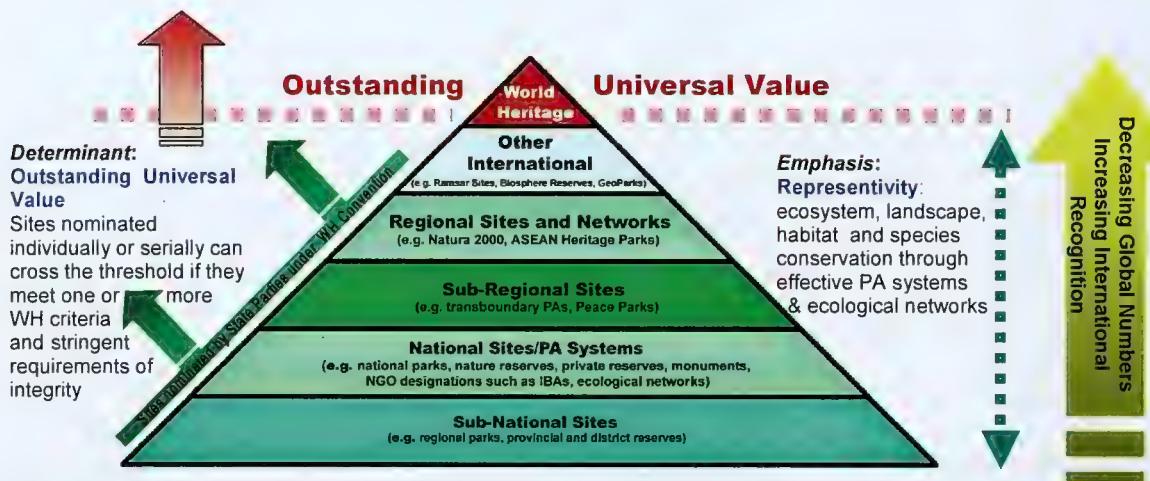
As noted in the introduction to the review, the core principle of the World Heritage Convention is that properties can only be inscribed on the WH List if they have *outstanding universal natural or cultural values (OUV)*, or both. This impinges on the notion of World Heritage being a tool that ensures complete representation of all biomes and habitats, since not all biomes and habitats contain areas of OUV - even they otherwise have high conservation values. Although the draft new Operational Guidelines of the Convention call for a balanced, *representative* and credible World Heritage List, it was never intended that the List should ensure complete 'representativity' of all the Earth's biomes, ecosystems and habitats. This is the role of the world's vast protected area network at both national and international levels. For example, at the international level, representativity is an explicit objective for the Global Biosphere Reserve Network. The difference in approach is explained in a background document (WHC-02/CONF.201/6) submitted to the April 2002 World Heritage Bureau meeting:

"One of the objectives of the MAB Programme is to create a representative list of sites corresponding to the Biogeographic Provinces (BP) of the world but this is not the objective of the WH Convention. The Convention deals with sites of outstanding universal value and there are many BPs that do not contain sites of this calibre. Therefore, in its analysis of the WH List and Tentative Lists IUCN will seek to identify those geographical areas and ecosystems of the world containing sites of potential outstanding universal value which are not represented on the WH List."

Therefore, the fundamental difference between the designation of WH status and other types of protected areas is the use of OUV as a *determinant* for inscription. This relationship is expressed diagrammatically in Figure 12. The diagram shows the relationship of World Heritage Sites to other types of national and international protected areas in terms of relative scale (global numbers) and the application of OUV as the key determinant for moving protected areas 'across the OUV line' onto the WH List. Below the OUV line, all protected areas are vital for ecosystem, landscape and species conservation based on the principle of effective *representativity*. This is not to undermine the important role that WH Sites also have in conserving, and promoting the conservation of, landscapes and biodiversity.

⁴ The GLCC dataset gives total global surface area as 511,155,619 km², of which 362,714,903 km² (70.96%) is sea.

Figure 12: The Relationship of World Heritage Sites to other Types of Protected Areas



This study has provided a basis for taking the WH Global Strategy and Tentative List process to the next stage: identifying sites with OUV and high integrity in those biogeographic regions, key habitats and priority biological diverse areas that are currently not inscribed on the WH List. There has already been significant progress in identifying and inscribing much of the world's outstanding natural heritage and it is likely that in the not-too-distant future all possible remaining areas with OUV will be Listed.

5.2 Recommendations

All of the elements examined in this review can assist States Parties to the WH Convention in assessing and revising their Tentative Lists and undertaking comparative analyses of nominations, despite the limitations of the GLCC dataset and the Udvardy system. It is recommended that countries use a combination of the various classification systems and priority conservation schemes in their national level analyses. Hopefully, improved global GIS will soon be available to assist in ongoing analyses.

The most useful classification and prioritisation schemes from the World Heritage perspective are the: IUCN/SSC habitats analysis; Udvardy biogeographic system and WWF Global 200 Ecoregions; and the CI Biodiversity Hotspots. The Endemic Bird Areas and Centres of Plant Diversity, due to their more specific focus, will add supplementary value to the other analyses. An overlay of all schemes for all continents/regions is presented in Maps 37-42.

As a result of the analyses undertaken, this review recommends that the following priority regions, habitats and hotspots be carefully assessed for sites that meet the determinants of Outstanding Universal Value and conditions of integrity, and may therefore be suitable for World Heritage inscription:

Udvardy Biogeographic Realms, Biomes and Provinces

All of the Udvardy biomes contain WH Sites except Cold Winter Deserts, with Tundra and Polar systems having the least common occurrence. In addition, 83 biogeographical provinces are

currently not found in WH Sites, excluding the two Antarctic provinces. Future compilations of Tentative Lists by relevant countries, and subsequent evaluations of any nominations by the Advisory Body and the WH Committee, could take these current omissions into account. Other recommendations below also coincide with the occurrence Udvardy biomes with low numbers of WH Sites and provinces without sites.

WWF Global 200 Ecoregions

Most of the G200 Ecoregions contain WH Sites, with a slightly higher proportion in terrestrial regions. Several terrestrial and marine ecoregions that do not currently have WH Sites and should be assessed include:

- Andaman (sites within the marine ecoregion);
- Arctic tundra;
- Benguela Current (marine) ;
- Central Asian deserts;
- Fiji (sites within the marine ecoregion);
- Gulf of California (marine);
- Karoo desert;
- Madagascar moist forests;
- Maldives/Chagos atolls (marine);
- New Caledonia dry and moist forests;
- Palau (sites within the marine ecoregion);
- Red Sea (sites within the marine ecoregion);
- Socotra desert;
- Sudd-Sahelian savanna and flooded grasslands;
- Tahiti (sites within the marine ecoregion);
- Volga and Lena River deltas; and
- Western Ghats and associated ecosystems (wetlands and forests).

IUCN/SSC Global Habitat Analysis

Habitat types that emerge from this analysis which could be examined for potential WH nomination include:

Africa

- Succulent Karoo⁵ in South Africa and Namibia;
- *fynbos* vegetation in the Cape Floristic Region⁶ in South Africa;
- flooded grasslands such as Okavango and the Sudd swamps;
- Eastern Arc Mountains* in Kenya and UR Tanzania;
- temperate juniper and cedar forests and Mediterranean Basin* shrubland of the Atlas mountains in Morocco, Algeria and Tunisia;
- saline Rift Valley lakes in East Africa;
- Red Sea corals;
- tropical mangroves, such as along the coasts of Kenya, UR Tanzania and Mozambique;
- Namib and Kalahari deserts;
- savannah sites in the Somali-Maasai regional centre of endemism in Ethiopia, Kenya and Somalia; and
- Madagascar Moist Forests*.

⁵ Denotes CI Biodiversity Hotspot

⁶ Subject to current nomination

Asia

- Dry Subtropical Forests in the Indian subcontinent such as the eastern slopes of the Western Ghats*; and Cambodia*;
- Tropical Moist Montane Forest, for example, on the western slopes of the Western Ghats* and higher elevations in the Philippines*, Sumatra* and Sulawesi*;
- temperate deserts in China/Mongolia and Central Asia;
- high latitude polar tundra regions in the Russian Federation; and
- Shrubland areas in the mountains on the Asian side of the Caucasus* (in Georgia, Azerbaijan, Armenia, Turkey and Iran).

Oceania/Australasia

- Mediterranean-type shrubland areas and savannahs in Southwest Australia*;
- Montane Rain Forest in New Caledonia*;
- Montane Rain Forests and Savannahs in Polynesia* and Micronesia*; and
- Mangroves in Northern Australia/southern Papua New Guinea.

North America

- Mediterranean-type shrub areas in the California Floristic Province*; and
- desert sites in Central Mexico.

South America

- Sub-Antarctic habitats in southern Chile, southern Argentina and South Georgia.
- Mosquito Coast forest along the Nicaraguan Coast*;
- Temperate Forest and Shrubland areas in Central Chile* including temperate needleleaf trees such as the Monkey Puzzle *Araucaria* spp and *Fitzroya cupressoides*;
- Sub-Antarctic grassland in the Falkland Islands or Tierra del Fuego;
- Sub-Antarctic/Temperate Rain Forest in southern Chile;
- higher altitude *puna* grasslands and shrublands in the Tropical Andes*;
- hot desert/coastal areas of Chile and Peru; and
- Sub-Antarctic rock and ice, such as South Georgia.

Europe

- coastal saline wetlands;
- Mediterranean *maquis*;
- wooded savannah, for example of the *montado* sylvo-agricultural system of holm and cork oak production in Portugal and Spain; and
- sub-polar tundra in Norway, Spitzbergen or Iceland.

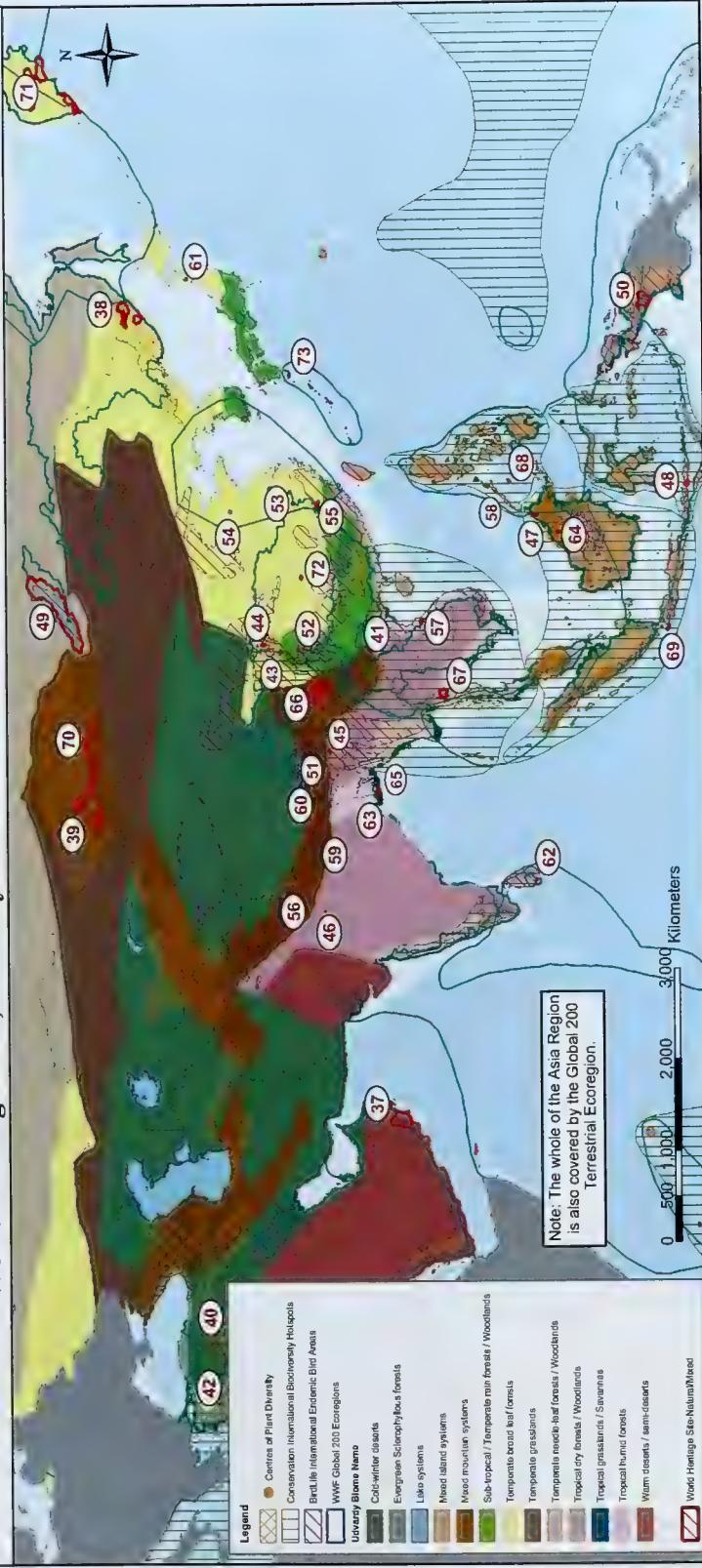
Conservation International Biodiversity Hotspots

WH Sites have been inscribed within 21 of the 25 hotspots and another (South Africa's Cape Floral Kingdom) is to be considered by the WH Committee in 2004. However, this does not necessarily mean that the best sites or all potential WH Sites in these 22 hotspots have been listed. A number of the hotspots coincide with the habitat priorities listed above. Excluding the Cape Floral Kingdom, the remaining hotspots without WH Sites that should be reviewed are:

- New Caledonia;
- Central Chile; and
- The Succulent Karoo

Additionally, two other hotspots have only marginal WH coverage: Southwest Australia and the California Floristic Province.

World Heritage Sites, Udvardy Biomes & Global Conservation Priorities in Asia



World Heritage Sites

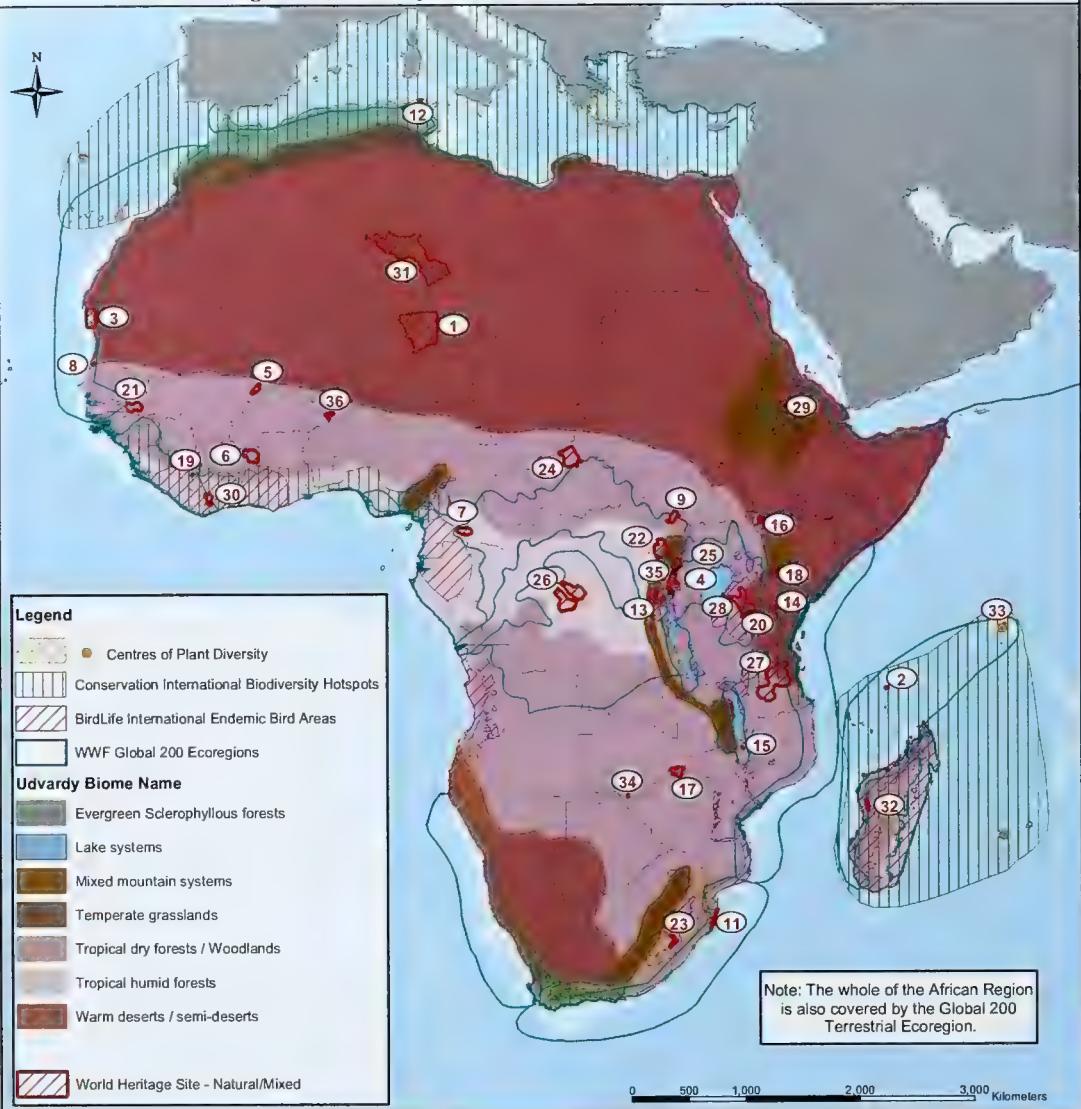
World Heritage Sites		
37. Arabian Oryx Sanctuary	46. Keoladeo National Park	58. Puerto - Princessa Subterranean River National Park
38. Central Sikhote - Alin	47. Kinabalu Park	59. Royal Chitwan National Park
39. Golden Mountains of Altai	48. Komodo National Park	60. Sagarmatha National Park
40. G eme National Park and the Rock Sites of Cappadocia	49. Lake Baikal	61. Shirakami - Sanchi
41. Ha Long Bay	50. Lorentz National Park	62. Sihamara Forest Reserve
42. Hierapolis - Pamukkale	51. Manas Wildlife Sanctuary	63. Sundarbans National Park
43. Huanglong Scenic and Historic Interest Area	52. Mount Emei and Leshan Giant Buddha	64. The Gungungh Muu National Park
44. Jiuzaigou Valley Scenic and Historic Interest Area	53. Mount Huangshan	65. The Sundarbans
45. Kaziranga National Park	54. Mount Taishan	66. Three Parallel Rivers of Yunnan Protected Areas
	55. Mount Wuyi	67. Thung Yai - Hua Khai Kaeng Wildlife Sanctuaries
	56. Nanda Devi National Park	68. Tubbataha Reef Marine Park
	57. Phong Nha Ke Bang National Park	69. Ujung Kulon National Park and Krakatoa National Reserve
		70. Urs Nuur Basin (Mongolia & Russian Fed.)
		71. Volcanoes of Kamchatka
		72. Wulingyuan Scenic and Historic Interest Area
		73. Yakushima

Geographic Projection

Compiled by: M. Mason
Date 000105 May 2004

Map 37

World Heritage Sites, Udvardy Biomes & Global Conservation Priorities in Africa



World Heritage Sites

1. Ar and Tchad Natural Reserves
2. Aldabra Atoll
3. Banc d'Arguin National Park
4. Bwindi Impenetrable National Park
5. Cliffs of Bandiagara (Land of the Dogons)
6. Comoé National Park
7. Dja Faunal Reserve
8. Djoudj National Bird Sanctuary
9. Garamba National Park
10. Gough Island Wildlife Reserve
11. Greater St Lucia Wetland Park
12. Ichkeul National Park
13. Kahuzi - Biega National Park
14. Kilimanjaro National Park
15. Lake Malawi National Park
16. Lake Turkana National Parks
17. Mana Pools National Park, Sapi and Chewore Safari Areas
18. Mount Kenya National Park/Forest
19. Mount Nimba Reserves
20. Ngorongoro Conservation Area
21. Niokolo - Koba National Park
22. Okapi Faunal Reserve
23. Okhahlamba - Drakensberg Park
24. Parc National de Manovo - Gounda - St Floris
25. Rwenzori Mountains National Park
26. Salonga National Park
27. Selous Game Reserve
28. Serengeti National Park
29. Simen National Park
30. Ta National Park
31. Tassili N'Ajjer
32. Tsingy de Bemaraha Strict Nature Reserve
33. Vallée de Mai Nature Reserve
34. Victoria Falls/Mosi-oa-Tunya
35. Virunga National Park
36. W National Park

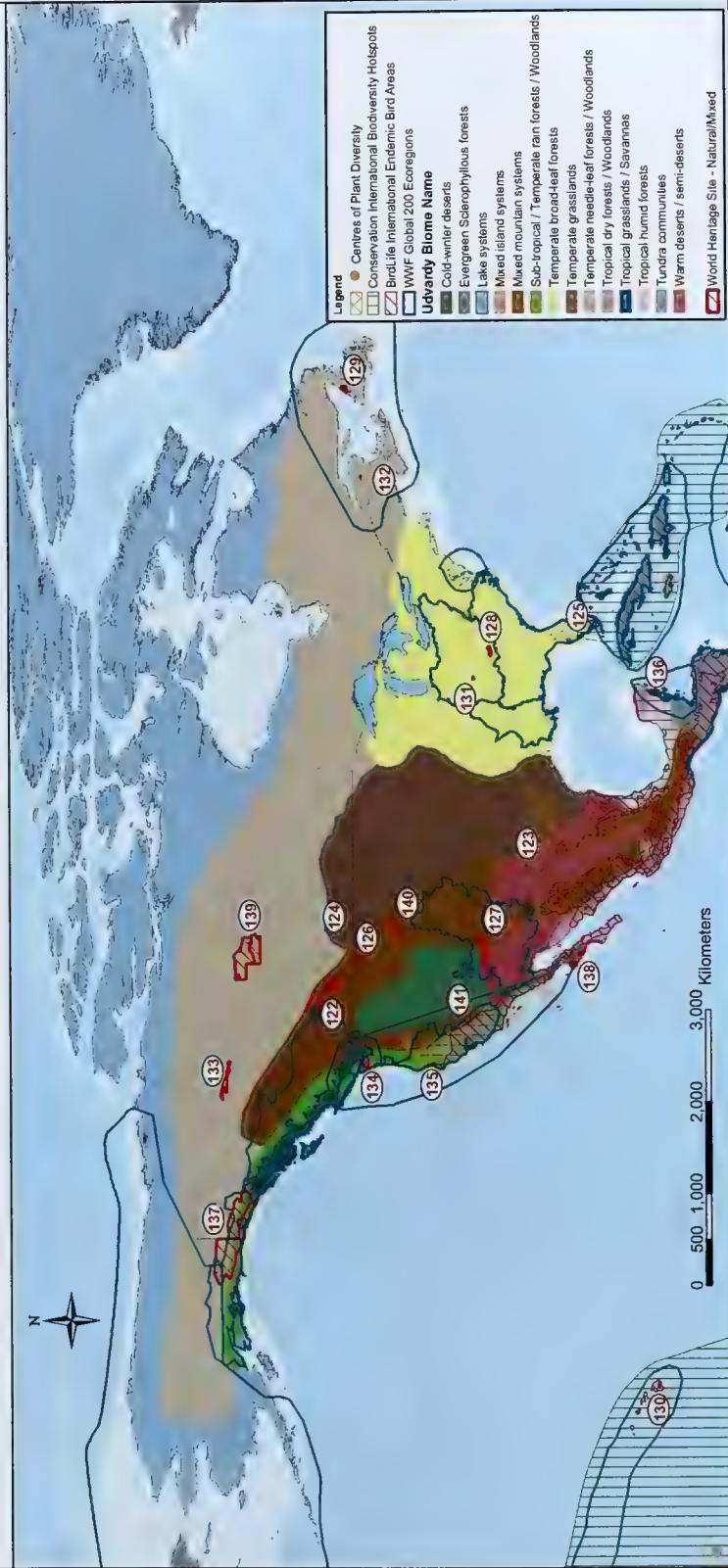
Geographic Projection

Compiled by: M. Mason
Date printed: May 2004

Source:
BirdLife International (2004) originally published in
Stattersfield, A., Crosby, M. J., Long, A.J. and Wege, D.C.
(1998) Endemic Bird Areas of the World: Priorities for bird
conservation. Gland, Switzerland: BirdLife International
(BirdLife Conservation Series 7). IUCN CPD dataset.
Udvardy, M.D.F. 1975 A Classification of the World's
Biogeographical Provinces of the World. IUCN, Morges,
Switzerland, Conservation International (2001). Biodiversity
Hotspots. Conservation International, Washington, DC
& UNEP-WCMC WDPA V 6.1 dataset

Map 38

Distribution of World Heritage Sites, Udvardy Biomes & Global Conservation Priorities in North America



Note: The whole of the North American Region
is also covered by the Global 200 Terrestrial Ecoregion

World Heritage Sites

- 122. Canadian Rocky Mountain Parks
- 123. Carlsbad Caverns
- 124. Dinosaur Provincial Park
- 125. Everglades National Park
- 126. Glacier and Waterton Lakes National Park
- 127. Grand Canyon National Park
- 128. Great Smoky Mountains National Park
- 129. Gros Morne National Park
- 130. Hawaii Volcanoes National Park
- 131. Mammoth Cave National Park
- 132. Miguasha Park
- 133. Nahanni National Park
- 134. Olympic National Park
- 135. Redwood National Park
- 136. Sian Ka'an
- 137. Taishenshiri - Alesk/Kluane
- 138. Wrangell - St Elias/ Glacier Bay
- 139. Wood Buffalo National Park
- 140. Yellowstone
- 141. Yosemite National Park

Note: The whole of the North American Region
is also covered by the Global 200 Terrestrial Ecoregion

Geographic Projection
Compiled by M. Mason
Date printed: May 2004

Source
BirdLife International (2004) originally published in
Sauerfeld A., Croxby, M. J., Long, A. J. and Wege, D. C.
(1986) Endemic bird areas of the world, priorities for bird
conservation. Cambridge, UK: BirdLife International
& Birdlife Conservation Series 7). IUCN/CD dataset,
UBA/UNDP/WWF (1975) A Classification of the
Biogeographical Provinces of the World. IUCN, Morges,
Switzerland. Conservation International (2001) Biodiversity
Hotspots Conservation International, Washington, DC
& UNEP-WCMC/WCPA V 6.1 dataset

Map 39

World Heritage Sites, Udvardy Biomes and Global Conservation Priorities in South America



World Heritage Sites

- 142. Alejandro de Humboldt National Park
- 143. Área de Conservación Guanacaste
- 144. Belize Barrier Reef Reserve System
- 145. Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves
- 146. Canaima National Park
- 147. Central Amazon Conservation Complex
- 148. Central Suriname Nature Reserve
- 149. Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks
- 150. Cocos Island National Park
- 151. Darién National Park
- 152. Desembarco del Granma National Park
- 153. Discovery Coast Atlantic Forest Reserves
- 154. Galapagos Islands
- 155. Historic Sanctuary of Macchu Picchu
- 156. Huascarán National Park
- 157. Iguazu National Park
- 158. Iguazú National Park
- 159. Ischigualasto - Talampaya Natural Parks
- 160. Los Glaciares
- 161. Los Katíos National Park
- 162. Manu National Park
- 163. Morne Trois Pitons National Park
- 164. Noel Kempff Mercado National Park
- 165. Pantanal Conservation Complex
- 166. Península Valdés
- 167. Rio Abiseo National Park
- 168. Río Plátano Biosphere Reserve
- 169. Sangay National Park
- 170. Southeast Atlantic Forest Reserves
- 171. Talamancas Range - La Amistad Reserves
- 172. Tikal National Park

Geographic Projection

Compiled by: M. Mason
Date printed: May 2004

Source
BirdLife International (2004) originally published in Stattersfield, A., Clegg, S.R., Wege, D.C. (1998) Endemic bird areas of the world: priorities for bird conservation. Cambridge, UK: BirdLife International (BirdLife Conservation Series 7). IUCN CPD dataset.
Udvardy, M.D.F. 1975 A Classification of the Biogeographical Provinces of the World. IUCN, Morges, Switzerland.; Conservation International, Washington, DC & UNEP-WCMC WDPA V 6.1 dataset

Map 40

Distribution of World Heritage Sites, Udvardy Biomes and Global Conservation Priorities in Europe



World Heritage Sites

- 94. Belovezhskaya Pushcha / Bialowieza National Park (Belarus and Poland)
- 95. Cape Giroletta, Cape Pono & Scandola Nature Reserves in Corsica
- 96. Caves of Aggtelek and Slovak Karst (Hungary and Slovakia)
- 97. Danube Delta
- 98. Dzrazha National Park
- 99. Dorset and East Devon Coast
- 100. Dumitrov National Park
- 101. Garajonay National Park
- 102. Giants' Causeway and Causeway Coast
- 103. Ibiza, Biodiversity and Culture
- 104. Isle d'Elle (Aeolian Islands)
- 105. Jungfrau - Aletsch - Bleischnorn

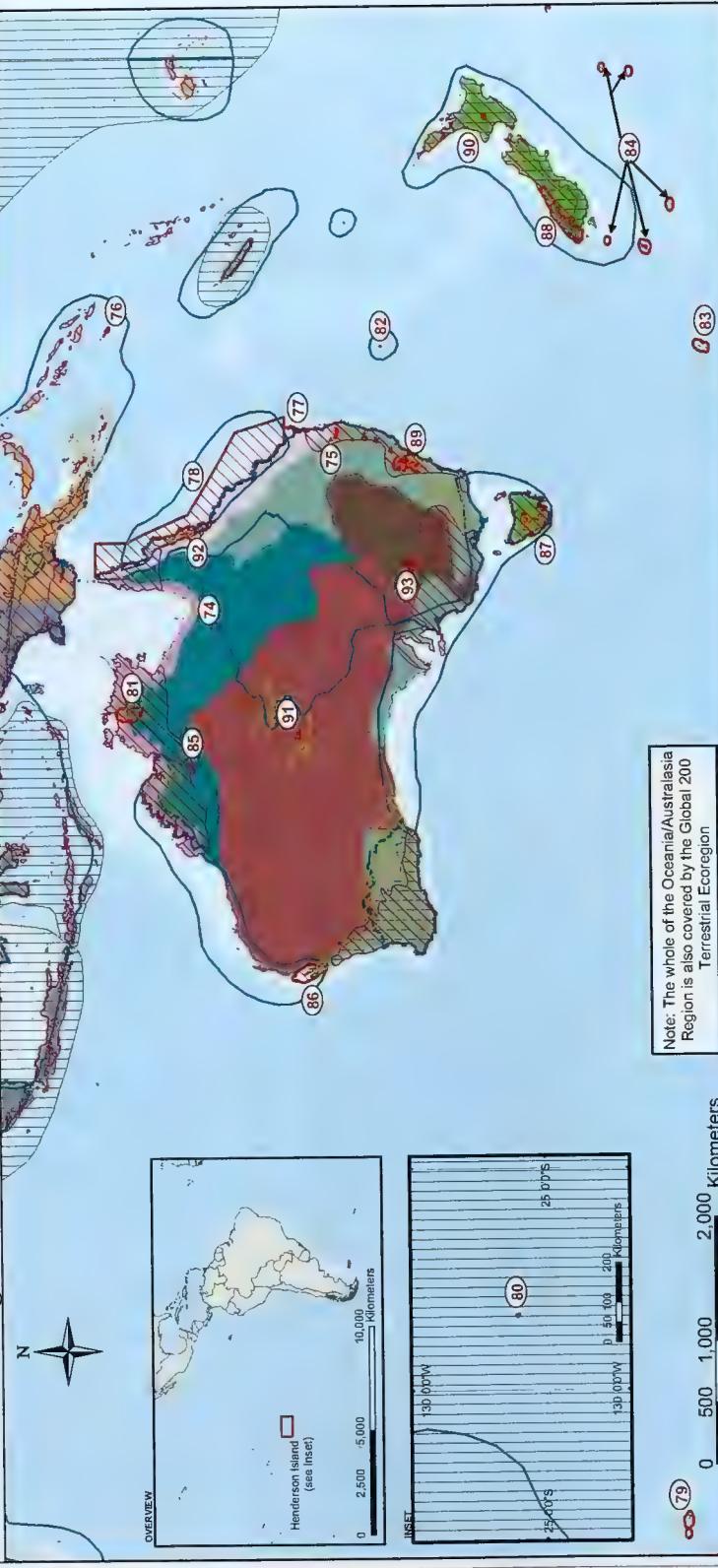
106. Laurisilva of Madeira
 107. Messel Pit Fossil Site
 108. Meteora
 109. Monte San Giorgio
 110. Mount Athos
 111. Oribi Gorge with its Cultural/Historical Aspect and its Natural Environment
 112. Pirin National Park
 113. Plitvice Lakes National Park
 114. Pyrénées - Mont Perdu (France and Spain)
 115. Skocjan Caves
 116. Subarctic Nature Reserve
 117. St. Kilda

Geographic Projection	M. Mason
Compiled by	
Date printed	May 2004
Source	BirdLife International (2000)
	Stansfield A., Crosby, M.
	(1998) Endemic bird area
	conservation. Cambridge: BirdLife Conservation Series.
	University, M.D.F. 1975 A. Bungaragold Provincial
	Sunderland., Conservation
	Hospitals, Conservation In
	U.N.E.P.-W.C.R.C. W.D.P.A.

Note: The whole of the Europe Region is also covered by the Global 200 Terrestrial Ecoregion

Map 41

World Heritage Sites & Udvardy Biomes and Global Conservation Priorities in Oceania/Australasia



Note: The whole of the Oceania/Australasia Region is also covered by the Global 200 Terrestrial Ecoregion

Legend		Udvardy Biome Name	Priority Category
	Centres of Plant Diversity		Evergreen Selvaticophyllous Forests
	Conservation International Biodiversity Hotspots		Mixed island systems
	BirdLife International Endemic Bird Areas		Sub-tropical Temperate rain forests / Woodlands
	WWF Global 200 Ecoregions		Tropical dry forests / Woodlands
	World Heritage Site-Natural(Mixed)		Tropical grasslands / Savannas
			Tropical humid forests
			Warm deserts / semi-deserts

World Heritage Sites

- 74. Australian Fossil Mammal Sites (Riversleigh / Naracoorte)
- 75. Central Eastern Australian Rainforest
- 76. East Renell
- 77. Fraser Island
- 78. Great Barrier Reef
- 79. Heard and McDonald Islands
- 80. Henderson Island
- 81. Kakadu National Park
- 82. Lord Howe Island Group
- 83. Macquarie Island
- 84. New Zealand Sub-Antarctic Islands
- 85. Purnululu National Park
- 86. Shark Bay Western Australia
- 87. Tasmanian Wilderness
- 88. Te Wahingonamu - South West New Zealand
- 89. The Greater Blue Mountains Area
- 90. Tongariro National Park
- 91. Uluru - Kata Tjuta National Park
- 92. Wet Tropics of Queensland
- 93. Willoandra Lakes Region

Priority Categories

- BirdLife International (2004) originally published in BirdLife International, A. Crosby, M. J. Long, A. J. Wege, O.C. Stattersfield, A. C. Butchart, and J. L. Evans (eds.), *Endemic bird areas of the world: priorities for bird conservation*. Cambridge, UK: BirdLife International.
- IUCN (1998) *Ecosystems of the world: priorities for biodiversity conservation*. Cambridge, UK: IUCN/CPD dataset.
- UICN (1994) *A classification of the Biogeographical Provinces of the World*. Morges, Switzerland: Conservation International.
- UNEP-WCMC (2001) *Biodiversity hotspots*. Conservation International, Washington, DC & UNEP-WCMC WCPA V.6.1 dataset.

Map 42

6. References

Chape, S., S. Blyth, P. Fox and M. Spalding (compilers) (2003). *2003 United Nations List of Protected Areas*. UNEP-WCMC and WCPA. IUCN, Gland, Switzerland and Cambridge, UK.

CIFOR, Gov. of Indonesia & UNESCO (1999). *World Heritage Forests: the World Heritage Convention as a Mechanism for Conserving Tropical Forest Biodiversity*. Proceedings of Berastagi meeting, 7–11 December 1998.

Gillet, H., R. Bishop, A. Smith and S. Blyth (1998). *A Global Overview of Protected Area on the World Heritage List of Particular Importance for Biodiversity*. A contribution to the Global Theme Study of World Heritage Natural Sites. WCMC, Cambridge, UK.

Green, E., Harrison, J., Baltran, J., Conway, L., Martins, S. & Spalding, M. (2001). *A Global Overview of Tropical Marine, Coastal and Small Island Ecosystems and the World Heritage List*. Discussion Paper. UNEP-WCMC, Cambridge, UK.

Groombridge, B. and M. Jenkins (2000). *Global Biodiversity: Earth's Living Resources in the 21st Century*. World Conservation Press, Cambridge, UK.

IUCN (1997). *A Global Overview of Forest Protected Areas on the World Heritage List*. Gland, Switzerland.

Olson, J.S., 1994a, Global ecosystem framework-definitions: USGS EROS Data Center Internal Report, Sioux Falls, SD.

Olson, J.S., 1994b, Global ecosystem framework-translation strategy: USGS EROS Data Center Internal Report, Sioux Falls, SD.

Smith, G., J. Jakubowska and I. May (2000). *A global overview of protected areas on the World Heritage List of Particular Importance for Biodiversity*. UNEP-WCMC, Cambridge UK.

Stattersfield, A.J., M.J. Crosby, A.J. Long and D.L. Wege. 1998. *Endemic Bird Areas of the World: Priorities for their Conservation*. BirdLife Conservation Series No. 7. BirdLife International, Cambridge, UK.

Thorsell, J. (2002). *Review of Natural Sites included in the World Heritage List and Tentative Lists: Preliminary Results*. Background Paper for IUCN World Heritage Panel Meeting, 2-6 December 2002. IUCN, Gland, Switzerland.

Thorsell, J., R.F. Levy and T. Sigaty (1997). *A Global Overview of Wetland and Marine Protected Areas on the World Heritage List*. A contribution to the Global Theme Study of World Heritage Natural Sites. IUCN, Gland, Switzerland.

Udvardy, M, (1975). *A Classification of the Biogeographical Provinces of the World. Prepared as a contribution to UNESCO's Man and the Biosphere Programme Project No. 18*. IUCN, Morges, Switzerland.

Wells, R. (1996). *Earth's Geological History – A Contextual Framework for Assessments of World Heritage Fossil Site Nominations*. World Heritage Committee, Gland, Switzerland.

WH (2002). *World Heritage 2002: Shared Legacy, Common Responsibility*. Associated Workshops Italy 11-12 November 2002. 'Partnerships to Conserve Nature and Biodiversity' Trieste. Conclusions of the International Workshop.

Wong, T., E. Hamilton-Smith, S. Chape and H. Friederich (2001). *Proceedings of the Asia-Pacific Forum on Karst Ecosystems and World Heritage. Gunung Mulu National Park World Heritage*

Area, Sarawak, Malaysia, 26-30 May 2001. Environment Australia/Asia-Pacific Focal Point/IUCN/UNESCO.

WWF and IUCN (1994-1995). *Centres of Plant Diversity. A Guide and Strategy for their Conservation.* 3 volumes. IUCN Publications Unit, Cambridge, UK.

7. Annexes

Annex 1: Natural World Heritage Sites

All sites inscribed on the World Heritage List for their natural values at January 2004 are listed below with brief descriptions⁷, in alphabetical order by country. Within countries sites are listed in chronological order of inscription on the WH List. Note that criteria used are pre-2004 revised Operational Guidelines.

Argentina

■ Los Glaciares (N ii, iii: 1981)

The Los Glaciares National Park is an area of exceptional natural beauty, with rugged, towering mountains and numerous glacial lakes, including Lake Argentino, which is 160 km long. At its farthest end, three glaciers meet to dump their effluvia into the milky grey glacial water, launching massive igloo icebergs into the lake.

■ Iguazú National Park (N iii, iv: 1984)

The semicircular waterfall at the heart of this site is some 80 m high and 2,700 m in diameter and is situated on a basaltic line spanning the border between Argentina and Brazil. Made up of many cascades producing vast sprays of water, it is one of the most spectacular waterfalls in the world. The surrounding subtropical rainforest has over 2,000 species of vascular plants and is home to the typical wildlife of the region: tapirs, giant anteaters, howler monkeys, ocelots, jaguars and caymans.

■ Península Valdés (N iv: 1999)

Península Valdés in Patagonia is a site of global significance for the conservation of marine mammals. It is home to an important breeding population of the endangered southern right whale as well as important breeding populations of southern elephant seals and southern sea lions. The orcas in this area have developed a unique hunting strategy to adapt to local coastal conditions.

■ Ischigualasto-Talampaya Natural Parks (N i: 2000)

These two contiguous parks, extending over 275,300 ha in the desert region on the western border of the Sierra Pampeanas of central Argentina, contain the most complete continental fossil record known from the Triassic Period (245-208 million years ago). Six geological formations in the parks contain fossils of a wide range of ancestors of mammals, dinosaurs and plants revealing the evolution of vertebrates and the nature of palaeo- environments in the Triassic Period.

Australia

■ Great Barrier Reef (N i, ii, iii, iv: 1981)

The Great Barrier Reef is a site of remarkable variety and beauty on the northeast coast of Australia. It contains the world's largest collection of coral reefs, with 400 types of coral and thousands of species of marine fauna.

■ Lord Howe Island Group (N iii, iv: 1982)

A remarkable example of isolated oceanic islands in the South Pacific Ocean, created by volcanic activity more than 2,000 m under the sea, these islands boast a spectacular topography and are home to numerous endemic species, especially birds.

⁷ Adapted from the UNESCO World Heritage Centre online: <http://whc.unesco.org/pg.cfm?cid=31>

■ Central Eastern Rainforest Reserves (Australia) (N i, ii, iv: 1986, 1994)

This site, comprising several protected areas, is situated predominantly along the Great Escarpment on Australia's east coast. The outstanding geological features displayed around shield volcanic craters and the high number of rare and threatened rainforest species are of international significance for science and conservation.

■ Wet Tropics of Queensland (N i, ii, iii, iv: 1988)

This area, which stretches along the northeast coast of Australia for some 450 km, is made up largely of tropical rainforests. The property contains extensive and varied array of plants, as well as rare and endangered animals and plant species.

■ Shark Bay, Western Australia (N i, ii, iii, iv: 1991)

At the most westerly point of the Australian continent, Shark Bay, with its islands and surrounding land area, has three exceptional natural features: its vast sea-grass beds, which are the largest (4,800 sq. km) and richest in the world; its dugong ('sea cow') population; and its stromatolites (colonies of algae which form hard, dome-shaped deposits and are among the oldest forms of life on Earth). Shark Bay is also home to five species of endangered mammals.

■ Fraser Island (N ii, iii: 1992)

Fraser Island lies just off the east coast of Australia. At 122 km long, it is the largest sand island in the world. Majestic remnants of tall rainforest growing on sand and half the world's perched freshwater dune lakes are found inland from the beach. The combination of shifting sand-dunes, tropical rainforests and lakes makes it an exceptional site.

■ Australian Fossil Mammal Sites (Riversleigh/Naracoorte) (N i, ii: 1994)

Riversleigh and Naracoorte, situated in the north and south respectively of eastern Australia, are among the world's 10 greatest fossil sites. They are a superb illustration of the key stages of evolution of Australia's unique fauna.

■ Heard and McDonald Islands (N i, ii: 1997)

Heard Island and McDonald Islands are located in the Southern Ocean, approximately 1,700 km from the Antarctic continent. As the only volcanically active Sub-Antarctic islands they 'open a window into the earth', thus providing the opportunity to observe ongoing geomorphic processes and glacial dynamics. The distinctive conservation value of Heard and McDonald - one of the world's rare pristine island ecosystems - lies in the complete absence of alien plants and animals, as well as human impact.

■ Macquarie Island (N i, iii: 1997)

Macquarie Island (34 km long x 5 km wide) is an oceanic island in the Southern Ocean, lying 1,500 km southeast of Tasmania and approximately halfway between Australia and the Antarctic continent. The island is the exposed crest of the undersea Macquarie Ridge, raised to its present position where the Indo- Australian tectonic plate meets the Pacific plate. It is a site of major geoconservation significance, being the only place on earth where rocks from the earth's mantle (6 km below the ocean floor) are being actively exposed above sea-level. These unique exposures include excellent examples of pillow basalts and other extrusive rocks.

■ Greater Blue Mountains Area (N ii, iv: 2000)

The Greater Blue Mountains Area consists of over 10,000 km² of sandstone plateaux, escarpments and gorges dominated by temperate eucalypt forest. The site, comprised of eight protected areas, is noted for its representation of the evolutionary adaptation and diversification of the eucalypts in post-Gondwana isolation on the Australian continent. The site provides significant representation of

Australia's biodiversity with ten percent of the vascular flora as well as significant numbers of rare or threatened species, including endemic and evolutionary relict species, such as the Wollemi pine, which have persisted in highly-restricted microsites.

■ **Purnululu National Park (N i, iii: 2003)**

The 2,397 km² Purnululu National Park is located in northwestern Western Australia. It contains the deeply dissected Bungle Bungle Range composed of Devonian-age quartz sandstone eroded over a period of 20 million years into a series of beehive-shaped towers or cones, whose steeply sloping surfaces are distinctly marked by regular horizontal bands of dark-grey cyanobacterial crust (single-celled photosynthetic organisms). These outstanding examples of cone karst owe their existence and uniqueness to several interacting geological, biological, erosional and climatic phenomena.

Bangladesh

■ **The Sundarbans (N ii, iv: 1997)**

The Sundarbans mangrove forest, one of the largest such forests in the world (1,400 km²), lies on the delta of the Ganges, Brahmaputra and Meghna rivers on the Bay of Bengal. It is adjacent to the border of India's Sundarbans World Heritage Site inscribed in 1987. The site is intersected by a complex network of tidal waterways, mudflats and small islands of salt-tolerant mangrove forests, and presents an excellent example of ongoing ecological processes. The area is known for its wide range of fauna, including 260 bird species, the Bengal tiger and other threatened species such as the estuarine crocodile and the Indian python.

Belarus and Poland

■ **Belovezhskaya Pushcha/Bialowieza Forest (N iii: 1979, 1992)**

Situated on the watershed of the Baltic Sea and the Black Sea, this immense forest range, consisting of evergreens and broad-leaved trees, is home to remarkable wildlife, including rare mammals such as the wolf, the lynx and the otter, as well as some 300 European Bison, a species which has been reintroduced into the park.

Belize

■ **Belize Barrier Reef Reserve System (N ii, iii, iv: 1996)**

The coastal area of Belize is an outstanding natural system consisting of the largest barrier reef in the northern hemisphere, offshore atolls, several hundred sand cays, mangrove forests, coastal lagoons and estuaries. The system's seven sites illustrate the evolutionary history of reef development and are a significant habitat for threatened species, including marine turtles, manatees and the American marine crocodile.

Bolivia

■ **Noel Kempff Mercado National Park (N ii, iv: 2000)**

This national park is one of the largest (15,230 km²) and most intact parks in the Amazon Basin. With an altitudinal range of 200 m to nearly 1,000 m, it is the site of a rich mosaic of habitat types from Cerrado savannah and forest to upland evergreen Amazonian forests. The park has an evolutionary history dating back over a billion years to the Precambrian period. An estimated 4,000 species of flora as well as over 600 bird species and viable populations of many globally endangered or threatened vertebrate species live in the park.

Brazil

■ Iguazu National Park (N iii, iv: 1986)

The park shares with Iguazú National Park in Argentina one of the world's largest and most impressive waterfalls, extending over some 2,700 m. It is home to many rare and endangered species of flora and fauna, among them the giant otter and the giant anteater.

■ Discovery Coast Atlantic Forest Reserves (N ii, iv: 1999)

The Discovery Coast Atlantic Forest Reserves, in the states of Bahia and Espírito Santo, consist of eight separate protected areas containing 1,120 km² of Atlantic forest and associated shrub (*restingas*). The rainforests of Brazil's Atlantic coast are the world's richest in terms of biodiversity. The site contains a distinct range of species with a high level of endemism and reveals a pattern of evolution that is of great scientific interest and important for conservation.

■ Atlantic Forest Southeast Reserves (N ii, iii, iv: 1999)

The Atlantic Forest Southeast Reserves, in the States of Paraná and São Paulo, contain some of the best and most extensive examples of Atlantic forest in Brazil. The 25 protected areas that make up the site (some 4,700 km² in total) display the biological wealth and evolutionary history of the last remaining Atlantic forests. From mountains covered by dense forests, down to wetlands, coastal islands with isolated mountains and dunes, the area comprises a rich natural environment of great scenic beauty.

■ Pantanal Conservation Area (N ii, iii, iv: 2000)

The Pantanal Conservation Complex consists of a cluster of four protected areas with a total area of 1,878 km². Located in western central Brazil at the southwest corner of the State of Mato Grosso, the site represents 1.3% of Brazil's Pantanal region, one of the world's largest freshwater wetland ecosystems. The headwaters of the region's two major river systems, the Cuiabá and the Paraguay rivers, are located here, and the abundance and diversity of its vegetation and animal life are spectacular.

■ Brazilian Atlantic Islands: Fernando de Noronha and Atol das Rocas Reserves (N ii, iii, iv: 2001)

Peaks of the Southern Atlantic submarine ridge form the Fernando de Noronha Archipelago and Rocas Atoll off the coast of Brazil. They represent a large proportion of the island surface of the South Atlantic and their productive waters are extremely important breeding and feeding areas for tuna, shark, turtle and marine mammals. The islands accommodate the largest concentration of tropical seabirds in the Western Atlantic. Baía de Golfinhos has an exceptional population of resident dolphin and at low tide the Rocas Atoll provides a spectacular seascape of lagoons and tidal pools teeming with fish.

■ Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks (N ii, iv: 2001)

The two sites included in the designation contain flora and fauna and key habitats that characterize the Cerrado – one of the world's oldest and most diverse tropical ecosystems. For millennia, these sites have acted as refuges for different species during periods of climate change and will be vital for maintaining the biodiversity of the Cerrado region during future climate fluctuations.

■ Central Amazon Conservation Complex (N ii, iv: 2003)

The 60,961 km² of the Central Amazon Conservation Complex, which includes the Jaú National Park that was inscribed on the List in 2000, make up the largest protected area in the Amazon Basin and one of the planet's richest regions in terms of biodiversity. It also includes an important sample of *varzea* ecosystems, *igapó* forests, lakes and channels that take the form of a constantly evolving aquatic mosaic that is home to the largest array of electric fish in the world. The site protects key threatened species, including giant arapaima fish, the Amazonian manatee, the black caiman, and two species of river dolphin.

Bulgaria

■ Srebarna Nature Reserve (N iv: 1983)

The reserve is a freshwater lake adjacent to the Danube and extending over 600 hectares. It is the breeding ground of almost 100 species of birds, many of which are rare or endangered. Some 80 other bird species migrate and seek refuge there every winter. Among the most interesting bird species are the Dalmatian pelican, great egret, night heron, purple heron, glossy ibis and white spoonbill.

■ Pirin National Park (N i, ii, iii: 1983)

Extending over an area of 274 km² at an altitude of 1,008-2,914 m in the Pirin mountains, in southwest Bulgaria, Pirin National Park has a limestone Balkan landscape, with lakes, waterfalls, caves and pine forests. The rugged mountains, with some 70 glacial lakes scattered throughout them, are home to hundreds of endemic and rare species, many of which are representative of the Balkan Pleistocene flora. The mountains also have diverse and unique landscapes of great aesthetic value.

Cameroon

■ Dja Faunal Reserve (N ii, iv: 1987)

This is one of the largest and best-protected rainforests in Africa, with 90% of its area undisturbed. Almost completely surrounded by the Dja River, which forms a natural boundary, the reserve is especially noted for its biodiversity and a wide variety of primates. It contains 107 mammal species, five of which are threatened.

Canada

■ Nahanni National Park (N ii, iii: 1978)

Located along the South Nahanni River, one of the most spectacular wild rivers in North America, this park contains deep canyons and huge waterfalls, as well as a unique limestone cave system. The park is also home to animals of the boreal forest, such as wolves, grizzly bears and caribou. Dall's sheep and mountain goats are found in the park's alpine environment.

■ Dinosaur Provincial Park (N i, iii: 1979)

In addition to its particularly beautiful scenery this WH Site - located at the heart of the province of Alberta's badlands - contains some of the most important fossil discoveries ever made from the 'Age of Reptiles', in particular about 35 species of dinosaur, dating back some 75 million years.

■ Wood Buffalo National Park (N ii, iii, iv: 1983)

Situated on the plains in the north-central region of Canada, the park (which covers 44,807 km²) is home to North America's largest population of wild bison. It is also the natural nesting place of the

whooping crane. Another of the park's attractions is the world's largest inland delta, located at the mouth of the Peace and Athabasca rivers.

■ **Canadian Rocky Mountain Parks (N i, ii, iii: 1984, 1990)**

The contiguous national parks of Banff, Jasper, Kootenay and Yoho, as well as the Mount Robson, Mount Assiniboine and Hamber provincial parks, studded with mountain peaks, glaciers, lakes, waterfalls, canyons and limestone caves, form a striking mountain landscape. The Burgess Shale fossil site, well known for its fossil remains of soft-bodied marine animals, is also found there.

■ **Gros Morne National Park (N i, iii: 1987)**

Situated on the west coast of Newfoundland, the park provides a rare example of the process of continental drift, where deep ocean crust and the rocks of the Earth's mantle lie exposed. More recent glacial action has resulted in some spectacular scenery, with coastal lowland, alpine plateau, fjords, glacial valleys, sheer cliffs, waterfalls and many pristine lakes.

■ **Miguasha Park (N I: 1999)**

The palaeontological site of Miguasha Park, in southeastern Quebec on the southern coast of the Gaspé peninsula, is considered to be the world's most outstanding illustration of the Devonian Period known as the 'Age of Fishes'. Dating from 370 million years ago, the Upper Devonian Escuminac Formation represented here contains five of the six fossil fish groups associated with this period. Its outstanding importance lies in it having the greatest number and best-preserved fossil specimens of the lobe-finned fishes that gave rise to the first four-legged, air-breathing terrestrial vertebrates - the tetrapods.

Canada and the United States of America

■ **Kluane/Wrangell-St Elias/Glacier Bay/Tatshenshini-Alsek (N ii, iii, iv: 1979, 1992, 1994)**

These parks comprise an impressive complex of glaciers and high peaks on both sides of the border between Canada (Yukon Territory and British Columbia) and the United States (Alaska). The spectacular natural landscapes are home to many grizzly bears, caribou and Dall's sheep. The site contains the largest non-polar icefield in the world.

■ **Waterton Glacier International Peace Park (N ii, iii: 1995)**

In 1932 Waterton Lakes National Park (Alberta, Canada) was combined with the Glacier National Park (Montana, United States) to form the world's first International Peace Park. Situated on the border between the two countries and offering outstanding scenery, the park is exceptionally rich in plant and mammal species as well as prairie, forest, and alpine and glacial features.

Central African Republic

■ **Manovo-Gounda St Floris National Park (N ii, iv: 1988)**

The importance of this park derives from its wealth of flora and fauna. Its vast savannahs are home to a wide variety of species: black rhinoceros, elephant, cheetah, leopard, wild dog, red-fronted gazelle and buffalo, while various types of waterfowl are to be found in the northern floodplains.

China

■ Jiuzhaigou Valley Scenic and Historic Interest Area (N iii: 1992)

Stretching over 720 km² in the northern part of Sichuan Province, the jagged Jiuzhaigou valley reaches a height of more than 4,800 m, thus comprising a series of diverse forest ecosystems. Its superb landscapes are particularly interesting for their series of narrow conic karst landforms and spectacular waterfalls. Large numbers of bird species also inhabit the valley, as well as a number of endangered plant and animal species, including the giant panda and the Sichuan takin.

■ Huanglong Scenic and Historic Interest Area (N iii: 1992)

Situated in the northwest of Sichuan Province, the Huanglong valley is comprised of snow-capped peaks and the easternmost of all the Chinese glaciers. In addition to its mountain landscape, diverse forest ecosystems can be found, as well as spectacular limestone formations, waterfalls and hot springs. The area also has a population of endangered animals, including the giant panda and the Sichuan golden snub-nosed monkey.

■ Wulingyuan Scenic and Historic Interest Area (N iii: 1992)

A spectacular area stretching over more than 260 km² in China's Hunan Province, the site is dominated by more than 3,000 narrow sandstone pillars and peaks, many over 200 m high. Between the peaks lie ravines and gorges with streams, pools and waterfalls, some 40 caves, and two large natural bridges. In addition to the striking beauty of the landscape, the region is also noted for the fact that it is home to a number of endangered plant and animal species.

■ Three Parallel Rivers of Yunnan Protected Areas (N i, ii, iii, iv: 2003)

Consisting of seven geographical clusters of protected areas within the boundaries of the Three Parallel Rivers National Park, in the mountainous northwest of Yunnan province, the 17,000 km² site features sections of the upper reaches of three of the great rivers of Asia: the Yangtze (Jinsha), Mekong and Salween. They flow roughly parallel, north to south, through steep gorges which, in places, are 3,000 m deep and are bordered by glaciated peaks more than 6,000 m high. The site is an epicentre of Chinese biodiversity. It is also one of the richest temperate regions of the world, in terms of biodiversity.

Colombia

■ Los Katíos National Park (N ii, iv: 1994)

Extending over 720 km² in northwestern Colombia, Los Katíos National Park comprises low hills, forests and humid plains. An exceptional biological diversity is found in the park, which is home to many threatened animal species, as well as many endemic plants.

Costa Rica

■ Cocos Island National Park (N ii, iv: 1997)

Cocos Island National Park, located 550 km off the Pacific coast of Costa Rica, is the only island in the tropical eastern Pacific with a tropical rainforest. Its position as the first point of contact with the northern equatorial counter-current, and the myriad interactions between the island and the surrounding marine ecosystem, make the area an ideal laboratory for the study of biological processes. The underwater world of the national park has become famous due to the attraction it holds for divers, who rate it as one of the best places in the world to view large pelagic species such as sharks, rays, tuna and dolphins.

■ **Area de Conservación Guanacaste (N ii, iv: 1999)**

This area contains important natural habitats for the conservation of biological diversity, including the best dry forest habitats from Central America to northern Mexico and key habitats for endangered or rare plant and animal species. The site demonstrates significant ecological processes in both its terrestrial and marine-coastal environments.

Costa Rica and Panama

■ **Talamanca Range-La Amistad Reserves/ La Amistad National Park (N i, ii, iii, iv: 1983, 1990)**

The location of this unique site in Central America, where Quaternary glaciers have left their mark, has allowed the fauna and flora of North and South America to merge. Tropical rainforests cover most of the area. Four different Indian tribes inhabit this property, which benefits from close co-operation between Costa Rica and Panama.

Côte d'Ivoire

■ **Taï National Park (N iii, iv: 1982)**

This park is one of the last major remnants of the primary tropical forest of West Africa. Its rich natural flora, and threatened mammal species such as the pygmy hippopotamus and 11 species of monkeys, are of great scientific interest.

■ **Comoé National Park (N ii, iv: 1983)**

One of the largest protected areas in West Africa, this park is characterized by its great plant diversity. Due to the presence of the Comoé river, it contains plants which are normally only found much farther south, such as shrub savannahs and patches of thick rainforest.

Croatia

■ **Plitvice Lakes National Park (N ii, iii: 1979, 2000)**

Waters flowing over limestone and chalk have, over thousands of years, deposited travertine barriers, creating natural dams which in turn have created a series of beautiful lakes, caves and waterfalls. These geological processes continue today. The forests in the park are home to bears, wolves and many rare bird species.

Cuba

■ **Desembarco del Granma National Park (N i, iii: 1999)**

This park, with its uplifted marine terraces and associated ongoing development of karst topography and features, represents a globally significant example of geomorphologic and physiographic features and ongoing geological processes. The area, which is situated in and around Cabo Cruz in southwest Cuba, includes spectacular terraces and cliffs, as well as some of the most impressive coastal cliffs bordering the western Atlantic.

■ **Alejandro de Humboldt National Park (N ii, iv: 2001)**

Complex geology and varied topography have led to a diversity of ecosystems and species unmatched in the Caribbean and created one of the most biologically diverse tropical island sites on earth. Many of the underlying rocks are toxic to plants so species have had to adapt to survive in

these hostile conditions. This unique process of evolution has resulted in the development of many new species and the park is one of the most important sites in the Western Hemisphere for the conservation of endemic flora. Endemism of vertebrates and invertebrates is also very high.

Democratic Republic of the Congo

■ Virunga National Park (N ii, iii, iv: 1979)

The national park (covering an area of 7,900 km²) comprises an outstanding diversity of habitats, ranging from swamps and steppes to the snowfields of Rwenzori at an altitude of over 5,000 m, and from lava plains to the savannahs on the slopes of volcanoes. Mountain gorillas are found in the park, some 20,000 hippopotamuses live in the rivers and birds from Siberia winter there.

■ Garamba National Park (N iii, iv: 1980)

The park's immense savannahs, grasslands and woodlands, interspersed with gallery forests along the river banks and the swampy depressions, are home to four large mammals: the elephant, giraffe, hippopotamus and above all the white rhinoceros. Though much larger than the black rhino: only about 30 individuals remain.

■ Kahuzi-Biega National Park (N iv: 1980)

A vast area of primary tropical forest dominated by two spectacular extinct volcanoes, Kahuzi and Biega, the park has a diverse and abundant fauna. One of the last groups of mountain gorillas (consisting of only about 250 individuals) lives at between 2,100 and 2,400 m above sea level.

■ Salonga National Park (N ii, iii: 1984)

This is Africa's largest tropical rainforest reserve. Situated at the heart of the central basin of the Zaire River, the park is very isolated and accessible only by water. It is the habitat of many endemic endangered species, such as the dwarf chimpanzee, the Zaire peacock, the forest elephant and the African slender-snouted or 'false' crocodile.

■ Okapi Wildlife Reserve (N iv: 1996)

The reserve occupies about one-fifth of the Ituri forest in northeast Zaire. The Zaire River basin, of which the reserve and forest are a part, is one of the largest drainage systems in Africa. The reserve contains threatened species of primates and birds and about 5,000 of the estimated 30,000 okapi surviving in the wild. It also has dramatic scenery, including waterfalls on the Ituri and Epulu rivers. The reserve is inhabited by traditional nomadic Mbuti and Efe pygmy hunters.

Dominica

■ Morne Trois Pitons National Park (N i, iv: 1997)

Luxuriant natural tropical forest and scenic volcanic features of great scientific interest occur in this national park centred on the 1,342-m high volcano known as Morne Trois Pitons. The site has precipitous slopes and deeply incised valleys, fumaroles, hot springs, freshwater lakes, a 'boiling lake' and five volcanoes, together with the richest biodiversity in the Lesser Antilles.

Ecuador

■ Galápagos Islands (N i, ii, iii, iv: 1978, 2001)

Situated in the Pacific Ocean 1,000 km from the South American continent, these nineteen islands and the surrounding marine reserve have been called a unique 'living museum and showcase of

evolution'. Ongoing seismic activity and volcanism reflect the processes that formed the islands. Located at the confluence of three oceanic currents, the Galápagos is a 'melting pot' of marine species. These processes, together with the extreme isolation of the islands, led to the development of unusual animal life – such as the land iguana, the giant tortoise and the many types of finch – that inspired Charles Darwin's theory of evolution following his visit in 1835.

■ **Sangay National Park (N ii, iii, iv: 1983)**

With its outstanding natural beauty and two active volcanoes, the park illustrates the entire spectrum of ecosystems, ranging from tropical rainforests to glaciers, with striking contrasts between the snowcapped peaks and the forests of the plains. Its isolation has encouraged the survival of indigenous species such as the mountain tapir and the Andean condor.

Ethiopia

■ **Simien National Park (N iii, iv: 1978)**

Massive erosion over the years on the Ethiopian plateau has created one of the most spectacular landscapes in the world, with jagged mountain peaks, deep valleys and sharp precipices dropping 1,500 m. The park is home to extremely rare animals such as the Gelada baboon, the Simien fox and the Walia ibex.

France

■ **Cape Girolata, Cape Porto, Scandola Nature Reserve, and the Piana Calanches in Corsica (N ii, iii, iv: 1983)**

The nature reserve, on the Scandola Peninsula - an impressive, porphyritic rock mass, is part of the Regional Natural Park of Corsica,. The vegetation is an outstanding example of scrubland. Seagulls, cormorants and sea eagles can be found there. The clear waters, with their islets and inaccessible caves, host a rich marine life.

Germany

■ **Messel Pit Fossil Site (N I: 1995)**

Messel Pit is the richest site in the world for understanding the living environment of the Eocene, 36-57 million years ago. In particular, it provides unique information about the early stages of the evolution of mammals and includes exceptionally well preserved mammal fossils, ranging from fully articulated skeletons to the contents of stomachs of animals of this period.

Guinea and Côte d'Ivoire

■ **Mount Nimba Strict Nature Reserve (N ii, iv: 1981)**

Located on the borders of Guinea, Liberia and Côte d'Ivoire, Mount Nimba rises above the surrounding savannah. Its slopes are covered by dense forest at the foot of grassy mountain pastures. They harbour an especially rich flora and fauna, with endemic species such as the viviparous toad and chimpanzees that use stones as tools.

Honduras

■ Río Plátano Biosphere Reserve (N i, ii, iii, iv: 1982)

Located on the watershed of the Río Plátano, the reserve is one of the few remains of a tropical rainforest in Central America and has an abundant and varied plant and wildlife. In its mountainous landscape sloping down to the Caribbean coast, over 2,000 indigenous people have preserved their traditional way of life.

Hungary and Slovakia

■ Caves of the Aggtelek Karst and Slovak Karst (N I: 1995, 2000)

The variety of formations and the fact that they are concentrated in a restricted area means that the 712 caves currently identified make up a typical temperate-zone karstic system. Because they display an extremely rare combination of tropical and glacial climatic effects, they make it possible to study geological history over tens of millions of years.

India

■ Kaziranga National Park (N ii, iv: 1985)

In the heart of Assam, this park is one of the last areas in eastern India undisturbed by a human presence. It is inhabited by the world's largest population of one-horned rhinoceros, as well as many mammals, including tigers, elephants, panthers and bears, and thousands of birds.

■ Manas Wildlife Sanctuary (N ii, iii, iv: 1985)

In the foothills of the Himalayas, where wooded hills give way to alluvial grasslands and tropical forests, the Manas sanctuary is home to a great variety of wildlife, including many endangered species, such as the tiger, pygmy hog, Indian rhinoceros and Indian elephant.

■ Keoladeo National Park (N iv: 1985)

This former duck-hunting reserve of the Maharajas is one of the major wintering areas for large numbers of aquatic birds from Afghanistan, Turkmenistan, China and Siberia. Almost 400 species of birds, including the rare Siberian crane, have been recorded in the park.

■ Sundarbans National Park (N ii, iv: 1987)

The Sundarbans covers 10,000 km² of land and water (more than half of it in India, the rest in Bangladesh) in the Ganges delta. It contains the world's largest area of mangrove forests. A number of rare or endangered species live in the park, including tigers, aquatic mammals, birds and reptiles.

■ Nanda Devi National Park (N iii, iv: 1988)

The Nanda Devi National Park is one of the most spectacular wilderness areas in the Himalayas. It is dominated by the peak of Nanda Devi, which rises to over 7,800 m. No humans live in the park, which has remained more or less intact because of its inaccessibility. It is the habitat of several endangered mammals, especially the snow leopard, Himalayan musk deer and bharal.

Indonesia

■ Ujung Kulon National Park (N iii, iv: 1991)

This national park, located in the extreme southwest tip of Java on the Sunda shelf, includes the Ujung Kulon Peninsula and several offshore islands and encompasses the natural reserve of

Krakatoa. In addition to its natural beauty and geological interest - particularly for the study of inland volcanoes - it contains the largest remaining area of lowland rainforests on the Java plain. Several species of endangered plants and animals can be found there, the Javan rhinoceros being the most under threat.

■ **Komodo National Park (N iii, iv: 1991)**

These volcanic islands are inhabited by a population of around 5,700 giant lizards, whose appearance and aggressive behaviour have led to them being called 'Komodo dragons'. They exist nowhere else in the world and are of great interest to scientists studying the theory of evolution. The rugged hillsides of dry savannah and pockets of thorny green vegetation contrast starkly with the brilliant white sandy beaches and surrounding marine environment.

■ **Lorentz National Park (N i, ii, iv: 1999)**

Lorentz National Park (25,000 km²) is the largest protected area in Southeast Asia. It is the only protected area in the world to incorporate a continuous, intact transect from snowcap to tropical marine environment, including extensive lowland wetlands. Located at the meeting-point of two colliding continental plates, the area has a complex geology with ongoing mountain formation as well as major sculpting by glaciation. The area also contains fossil sites which provide evidence of the evolution of life on New Guinea, a high level of endemism and the highest level of biodiversity in the region.

Italy

■ **Isole Eolie (Aeolian Islands) (N i: 2000)**

The Aeolian Islands provide an outstanding record of volcanic island building and destruction, and ongoing volcanic phenomena. Studied since at least the 18th century, the islands have provided the science of vulcanology with examples of two types of eruption (Vulcanian and Strombolian) and thus have featured prominently in the education of geologists for more than 200 years. The site continues to enrich the field of vulcanology.

Japan

■ **Yakushima (N ii, iii: 1993)**

Located in the interior of Yaku Island, at the meeting-point of the palaearctic and oriental biotic regions, Yakushima exhibits a rich flora, with some 1,900 species and subspecies, including ancient specimens of the *sugi* (Japanese cedar). It also contains a remnant of a warm-temperate ancient forest that is unique in this region.

■ **Shirakami-Sanchi (N ii: 1993)**

Situated in the mountains of northern Honshu, this trackless site includes the last virgin remains of the cool-temperate forest of Siebold's beech trees that once covered the hills and mountain slopes of northern Japan. The black bear, the serow and 87 species of birds can be found in this forest.

Kenya

■ **Mount Kenya National Park/Natural Forest (N ii, iii: 1997)**

At 5,199 m, Mount Kenya is the second highest peak in Africa. It is an ancient extinct volcano, during whose period of activity (2.6-3.1 million years ago) it is thought to have risen to 6,500 m. There are 12 remnant glaciers on the mountain, all receding rapidly, and four secondary peaks that

sit at the head of the U-shaped glacial valleys. With its rugged glacier-clad summits and forested middle slopes, Mount Kenya is one of the most impressive landscapes in East Africa. The evolution and ecology of its afro-alpine flora also provide an outstanding example of ecological processes.

■ Lake Turkana National Parks (N i, iv: 1997, 2001)

The most saline of Africa's large lakes, Turkana is an outstanding laboratory for the study of plant and animal communities. The three National Parks are a stopover for migrant waterbirds and are major breeding grounds for the Nile crocodile, hippopotamus and a variety of venomous snakes. The Koobi Fora deposits, rich in mammalian, molluscan and other fossil remains, have contributed more to understanding palaeo-environments than any other site on the continent.

Madagascar

■ Tsingy de Bemaraha Strict Nature Reserve (N iii, iv: 1990)

Tsingy de Bemaraha Strict Nature Reserve comprises karst landscapes and limestone uplands cut into impressive *tsingy* peaks and a 'forest' of limestone needles, the spectacular canyon of the Manambolo River, rolling hills and high peaks. The undisturbed forests, lakes and mangrove swamps are the habitat for rare and endangered lemurs and birds.

Malawi

■ Lake Malawi National Park (N ii, iii, iv: 1984)

Located at the southern end of the great expanse of Lake Malawi, with its deep, clear waters and mountain backdrop, the national park is home to many hundreds of fish species, nearly all endemic. Its importance for the study of evolution is comparable to that of the finches of the Galapagos Islands.

Malaysia

■ Kinabalu Park (N ii, iv: 2000)

Kinabalu Park, in the State of Sabah on the northern end of the island of Borneo, is dominated by Mount Kinabalu (4,095 m), the highest mountain between the Himalayas and New Guinea. It has a very wide range of habitats, from rich tropical lowland and hill rainforest to tropical mountain forest, sub-alpine forest and scrub on the higher elevations. It has been designated as a Centre of Plant Diversity for Southeast Asia and is exceptionally rich in species with examples of flora from the Himalayas, China, Australia, Malaysia, as well as pan-tropical flora.

■ Gunung Mulu National Park (N i, ii, iii, iv: 2000)

Important both for its high biodiversity and for its karst features, Gunung Mulu National Park, in the State of Sarawak on the island of Borneo, is the most studied tropical karst area in the world. The 527 km² park contains 17 vegetation zones, exhibiting some 3,500 species of vascular plants. Its palm species are exceptionally rich, with 109 species in 20 genera noted. The park is dominated by Gunung Mulu, a 2,377 m high sandstone pinnacle. At least 295 km of explored caves provide a spectacular sight and are home to millions of cave swiftlets and bats. The Sarawak Chamber, 600 m by 415 m and 80 m high, is the largest known cave chamber in the world.

Mauritania

■ Banc d'Arguin National Park (N ii, iv: 1989)

Fringing the Atlantic coast, the park comprises sand dunes, coastal swamps, small islands and shallow coastal waters. The contrast between the harsh desert environment and the biodiversity of the marine zone has resulted in a land- and seascape of outstanding natural significance. A wide variety of migrating birds spend the winter there. Several species of sea turtle and dolphin, used by the fishermen to attract shoals of fish, are also found.

Mexico

■ Sian Ka'an (N iii, iv: 1987)

Located on the east coast of the Yucatán peninsula, this Biosphere Reserve contains tropical forests, mangroves and marshes, as well as a large marine area intersected by a barrier reef. It provides a habitat for a remarkably rich flora and a fauna comprising more than 300 species of birds, as well as a large number of the region's characteristic terrestrial vertebrates, which cohabit in the diverse environment formed by its complex hydrological system.

■ Whale Sanctuary of El Vizcaino (N iv: 1993)

Located in the central part of the peninsula of Baja California the coastal lagoons of Ojo de Liebre and San Ignacio are important reproduction and wintering sites for the grey whale, harbour seal, California sea lion, northern elephant-seal and blue whale. The lagoons are also home to four species of the endangered marine turtle.

Mongolia/Russian Federation

■ Uvs Nuur Basin (N ii, iv: 2003)

The Uvs Nuur Basin (10,689 km²) is the northern-most of the enclosed basins of Central Asia. It takes its name from the Uvs Nuur Lake, a large, shallow and very saline lake, important for migrating birds, waterfowl, and seabirds. The site is made up of 12 clusters representing the major biomes of eastern Eurasia. The steppe ecosystem supports a rich diversity of birds and the desert is home to a number of rare gerbil, jerboas and the marbled polecat. The mountains are important refuges for the globally endangered snow leopard, mountain sheep (argali) and the Asiatic ibex.

Nepal

■ Sagarmatha National Park (N iii: 1979)

Sagarmatha is an exceptional area with dramatic mountains, glaciers and deep valleys, dominated by Mount Everest, the highest peak in the world (8,848 m). Several rare species, such as the snow leopard and the lesser panda, are found in the park.

■ Royal Chitwan National Park (N ii, iii, iv: 1984)

At the foot of the Himalayas, Chitwan is one of the few remaining undisturbed vestiges of the *terai* region, which formerly extended over the foothills of India and Nepal. It has a particularly rich flora and fauna. One of the last populations of single-horned Asiatic rhinoceros lives in the park, which is also one of the last refuges of the Bengal tiger.

New Zealand

■ Te Wahipounamu-Southwest New Zealand (N i, ii, iii, iv: 1990)

The landscape in this park, situated in southwest New Zealand, has been shaped by successive glaciations into fjords, rocky coasts, towering cliffs, lakes and waterfalls. Two-thirds of the park is covered with southern beech and podocarps, some of which are over 800 years old. The kea, the only alpine parrot in the world, lives in the park, as does the rare and endangered takahe, a large flightless bird.

■ New Zealand Sub-Antarctic Islands (N ii, iv: 1998)

The New Zealand Sub-Antarctic Islands consist of five island groups (the Snares, Bounty Islands, Antipodes Islands, Auckland Islands and Campbell Island) in the Southern Ocean southeast of New Zealand. The islands, lying between the Antarctic and Subtropical Convergences, have a high level of productivity, biodiversity, wildlife population densities and endemism among birds, plants and invertebrates. They are particularly notable for the large number and diversity of pelagic seabirds and penguins that nest there. There are 126 bird species in total, including 40 seabirds of which five breed nowhere else in the world.

Niger

■ Air and Ténéré Natural Reserves (N ii, iii, iv: 1991)

This is the largest protected area in Africa, covering some 77,000 km², though the area considered a protected sanctuary constitutes only one-sixth of the total area. It includes the volcanic rock mass of the Aïr, a small Sahelian pocket, isolated as regards its climate and flora and fauna, and situated in the Saharan desert of Ténéré. The reserves have an outstanding variety of landscapes, plant species and wild animals.

■ W National Park of Niger (N ii, iv: 1996)

The part of 'W' National Park that lies in Niger is situated in a transition zone between savannah and forest lands and represents important ecosystem characteristics of the West African Woodlands/Savannah Biogeographical Province. The site reflects the interaction between natural resources and humans since Neolithic times and illustrates the evolution of biodiversity in this zone.

Oman

■ Arabian Oryx Sanctuary (N iv: 1994)

The Arabian Oryx Sanctuary is an area within the Central Desert and Coastal Hills biogeographical regions of Oman. Seasonal fogs and dews support a unique desert ecosystem whose diverse flora includes several endemic plants. Its rare fauna includes the first free-ranging herd of Arabian oryx since the global extinction of the species in the wild in 1972 and its reintroduction here in 1982. The only wild breeding sites in Arabia of the endangered houbara bustard, a species of wader, are also to be found, as well as Nubian ibex, Arabian wolves, honey badgers, caracals and the largest wild population of Arabian gazelle.

Panama

■ Darien National Park (N ii, iii, iv: 1981)

Forming a bridge between the two continents of the New World, Darien National Park contains an exceptional variety of habitats - sandy beaches, rocky coasts, mangroves, swamps, and lowland and upland tropical forests containing remarkable wildlife.

Peru

■ Huascarán National Park (N ii, iii: 1985)

Situated in the Cordillera Blanca, the world's highest tropical mountain range, Mount Huascarán rises to 6,768 m above sea level. The deep ravines watered by numerous torrents, the glacial lakes and the variety of the vegetation make it a site of spectacular beauty. Species include the spectacled bear and the Andean condor.

■ Manu National Park (N ii, iv: 1987)

This 15,000 km² park has successive tiers of vegetation rising from 150 to 4,200 m above sea level. The tropical forest in the lower tiers is home to a great variety of animal and plant species. Some 850 species of birds have been identified and rare species such as the giant otter and the giant armadillo also find refuge there. Jaguars are often sighted in the park.

Philippines

■ Tubbataha Reef Marine Park (N ii, iii, iv: 1993)

The park covers 332 km², including the North and South Reefs, and is a unique example of an atoll reef with a very high density of marine species. The North Islet serves as a nesting site for birds and marine turtles. The site is an excellent example of a coral reef with a spectacular 100 m perpendicular wall, extensive lagoons and two coral islands.

■ Puerto-Princesa Subterranean River National Park (N iii, iv: 1999)

This park features a spectacular limestone karst landscape with an underground river. One of the river's distinguishing features is that it emerges directly into the sea, and its lower portion is subject to tidal influences. The area also represents a significant habitat for biodiversity conservation. The site contains a full 'mountain-to-sea' ecosystem and has some of the most important forests in Asia.

Portugal

■ Laurisilva of Madeira (N ii, iv: 1999)

The Laurisilva of Madeira is an outstanding relict of a previously widespread laurel forest type. It is the largest surviving area of laurel forest and is believed to be 90% primary forest. It contains a unique suite of plants and animals, including many endemic species such as the Madeiran long-toed pigeon.

Romania

■ Danube Delta (N iii, iv: 1991)

The waters of the Danube, which flow into the Black Sea, form the largest and best preserved of Europe's deltas. The Danube delta hosts over 300 species of birds as well as 45 freshwater fish species in its numerous lakes and marshes.

Russian Federation

■ Virgin Komi Forests (N ii, iii: 1995)

The Virgin Komi Forests cover 32,800 km² of tundra and mountain tundra in the Urals, as well as one of the most extensive areas of virgin boreal forest remaining in Europe. This vast area of conifers, aspens, birches, peat bogs, rivers and natural lakes has been monitored and studied for over 50 years. It provides valuable evidence of the natural processes affecting biodiversity in the taiga.

■ Volcanoes of Kamchatka (N i, ii, iii, iv: 1996, 2001)

This is one of the most outstanding volcanic regions in the world, with a high density of active volcanoes, a variety of types, and a wide range of related volcanic features. The six sites included in the serial designation group together the majority of volcanic features of the Kamchatka Peninsula. The interplay of volcanism with active glaciers forms a dynamic landscape of great beauty. The sites contain high species diversity, including the world's greatest known variety of salmonoid fish and exceptional concentrations of sea otter, brown bear and Stellar's sea eagle.

■ Lake Baikal (N i, ii, iii, iv: 1996)

Situated in southeast Siberia, the 31,500 km² Lake Baikal is the oldest (25 million years) and deepest (1,700 m) lake in the world. It contains 20% of the world's total unfrozen freshwater reserve. Known as the 'Galapagos of Russia', its age and isolation have produced one of the world's richest and most unusual freshwater faunas, which is of exceptional value to evolutionary science.

■ Golden Mountains of Altai (N iv: 1998)

The Altai mountains in southern Siberia form the major mountain range in the western Siberia biogeographic region and provide the source of its greatest rivers - the Ob and the Irtysh. Three separate areas are inscribed: Altaisky Zapovednik and a buffer zone around Lake Teletskoye; Katunsky Zapovednik and a buffer zone around Mount Belukha; and the Ukok Quiet Zone on the Ukok plateau. The total area covers 16,115 km². The region represents the most complete sequence of altitudinal vegetation zones in central Siberia, from steppe, forest-steppe, mixed forest, subalpine vegetation to alpine vegetation. The site is also an important habitat for endangered animal species such as the snow leopard.

■ Western Caucasus (N ii, iv: 1999)

The Western Caucasus, extending over 2,750 km² of the extreme western end of the Caucasus mountains and located 50 km northeast of the Black Sea, is one of the few large mountain areas of Europe that has not experienced significant human impact. Its subalpine and alpine pastures have only been grazed by wild animals, and its extensive tracts of undisturbed mountain forests, extending from the lowlands to the subalpine zone, are unique in Europe. The site has a great diversity of ecosystems, with important endemic plants and wildlife, and is the place of origin and reintroduction of the mountain subspecies of the European bison.

■ Central Sikhote-Alin (N iv: 2001)

The Sikhote-Alin mountain range contains one of the richest and most unusual temperate forests of the world. In this mixing zone between taiga and subtropics, southern species such as the tiger and Himalayan bear cohabit with northern species such as the brown bear and lynx. The site runs from the peaks of Sikhote-Alin to the Sea of Japan and is important for the survival of many endangered species such as the Amur tiger.

Senegal

■ Djoudj National Bird Sanctuary (N iii, iv: 1981)

Situated in the Senegal river delta, the Djoudj Sanctuary is a wetland of 160 km², comprising a large lake surrounded by streams, ponds and backwaters. It forms a living but fragile sanctuary for some 1.5 million birds, such as the white pelican, the purple heron, the African spoonbill, the great egret and the cormorant.

■ Niokolo-Koba National Park (N iv: 1981)

Located in a well-watered area along the banks of the Gambia river, the gallery forests and savannahs of Niokolo-Koba National Park have a very rich fauna, among them Derby elands (largest of the antelopes), chimpanzees, lions, leopards and a large population of elephants, as well as many birds, reptiles and amphibians.

Serbia and Montenegro

■ Durmitor National Park (N ii, iii, iv: 1980)

This national park was formed by glaciers and is traversed by rivers and underground streams. Along the Tara River canyon, which has the deepest gorges in Europe, the dense pine forests are interspersed with clear lakes and harbour a wide range of endemic flora.

Seychelles

■ Aldabra Atoll (N ii, iii, iv: 1982)

The atoll is comprised of four large coral islands which enclose a shallow lagoon; the group of islands is itself surrounded by a coral reef. Due to difficulties of access and the atoll's isolation, Aldabra has been protected from human influence and thus retains around 150,000 giant tortoises, the world's largest population of this reptile.

■ Vallée de Mai Nature Reserve (N i, ii, iii, iv: 1983)

In the heart of the small island of Praslin, the reserve has the vestiges of a natural palm forest preserved in almost its original state. The famous coco-de-mer, from a palm once believed to grow in the depths of the sea, is the largest seed in the plant kingdom.

Slovenia

■ Skocjan Caves (N ii, iii: 1986)

This exceptional system of limestone caves comprises collapsed dolines, some six kilometres of underground passages with a total depth of more than 200 m, many waterfalls and one of the largest known underground chambers. The site, located in the Kras region (literally meaning Karst), is one of the most famous in the world for the study of karstic (limestone) phenomena.

Solomon Islands

■ East Rennell (N ii: 1998)

East Rennell makes up the southern third of Rennell Island, the southernmost island in the Solomon Island group in the western Pacific. Rennell, 86 km long by 15 km wide, is the largest raised coral atoll in the world. The site of approximately 370 km² includes a marine area extending three nautical miles to sea. A major feature of the island is Lake Tegano, which was the former lagoon on the atoll. The lake, the largest in the insular Pacific (155 km²), is brackish and contains many rugged limestone islands and endemic species. Rennell is mostly covered with dense forest, with a canopy averaging 20 m in height. Combined with the strong climatic effects of frequent cyclones, the site is a true natural laboratory for scientific study. The site is under customary land ownership and management.

South Africa

■ Greater St Lucia Wetland Park (N ii, iii, iv: 1999)

Located on South Africa's east coast, the ongoing fluvial, marine and aeolian processes in the have produced a variety of landforms, including coral reefs, long sandy beaches, coastal dunes, lake systems, swamps, and extensive reed and papyrus wetlands. The interplay of the park's environmental heterogeneity with major floods and coastal storms and a transitional geographic location between subtropical and tropical Africa has resulted in exceptional species diversity and ongoing speciation. The mosaic of landforms and habitat types creates superlative scenic vistas. The site contains critical habitat for a range of species from Africa's marine, wetland and savannah environments.

Spain

■ Garajonay National Park (N i, iii: 1986)

Laurel forest covers about 70% of this park, situated in the middle of the island of La Gomera in the Canary Islands archipelago. The presence of springs and numerous streams assures a lush vegetation resembling that of the Tertiary, which, due to climatic changes, has largely disappeared from southern Europe.

■ Doñana National Park (N ii, iii, iv: 1994)

Doñana National Park in Andalusia occupies the right bank of the Guadalquivir River at its estuary on the Atlantic Ocean. It is notable for the great diversity of its biotopes, especially lagoons, marshlands, fixed and mobile dunes, scrub woodland and maquis. It is home to five threatened bird species. It is one of the largest heronries in the Mediterranean region and is the wintering site for more than 500,000 water fowl each year.

Sri Lanka

■ Sinharaja Forest Reserve (N ii, iv: 1988)

Located in southwest Sri Lanka, Sinharaja is the country's last viable area of primary tropical rainforest. More than 60% of the trees are endemic and many of them are considered rare. There is much endemic wildlife, especially birds, but the reserve is also home to over 50% of Sri Lanka's endemic species of mammals and butterflies, as well as many kinds of insects, reptiles and rare amphibians.

Suriname

■ Central Suriname Nature Reserve (N ii, iv: 2000)

The Central Suriname Nature Reserve comprises 16,000 km² of primary tropical forest of west-central Suriname. It protects the upper watershed of the Coppename River and the headwaters of the Lucie, Oost, Zuid, Saramaccz, and Gran Rio rivers and covers a range of topography and ecosystems of notable conservation value due to its pristine state. Its montane and lowland forests contain a high diversity of plant life with more than 5,000 vascular plant species collected to date. The Reserve's animals are typical of the region and include the jaguar, giant armadillo, giant river otter, tapir, sloths, eight species of primates and 400 bird species such as harpy eagle, Guiana cock-of-the-rock, and scarlet macaw.

Sweden

■ High Coast (N I: 2000)

The High Coast is located on the west shore of the Gulf of Bothnia, a northern extension of the Baltic Sea. The area covers 1,425 km² including a marine component of 800 km², which includes a number of offshore islands. The irregular topography of the region, a series of lakes, inlets and flat hills rising to 350 m, is largely shaped by the combined processes of glaciation, glacial retreat and the emergence of new land from the sea. Since the final retreat of the ice from the High Coast 9,600 years ago, the uplift has been in the order of 285 m, which is the highest evident "rebound" known. The High Coast is an outstanding site for the understanding of the important processes that have formed the glaciated and land uplift areas of the Earth's surface.

Switzerland

■ Jungfrau-Aletsch-Bietschhorn (N i, ii, iii: 2001)

This is the most glaciated region of the Alps, containing Europe's largest glacier and a range of classic glacial features such as U-shaped valleys, cirques, horn peaks and moraines. It provides an outstanding geological record of the uplift and compression that formed the High Alps. The diversity of wildlife is represented in a range of Alpine and sub-Alpine habitats and plant colonization in the wake of retreating glaciers provides an outstanding example of plant succession. The impressive vista of the North Wall of the High Alps, centred on the Eiger, Mönch and Jungfrau peaks, has played an important role in European literature and art.

■ Monte San Giorgio (N I: 2003)

A pyramid-shaped, wooded mountain (summit at 1,096 metres above sea level), Monte San Giorgio lies to the south of Lake Lugano in Canton Ticino. It is regarded as the best fossil record of marine life from the Mid-Triassic Period (245-230 million years ago). The current extent of discoveries includes more than 10,000 fossil specimens representing many species. Notable among the vertebrate material - which includes large, articulated skeletons up to 6 metres in length - is the presence of ichthyosaurs, nothosaurs, placodonts, and the remarkable 'giraffe necked' saurian, *Tanystropheus*.

Thailand

■ Thungyai-Huai Kha Khaeng Wildlife Sanctuaries (N ii, iii, iv: 1991)

Covering more than 6,000 km² along the Thailand-Myanmar border, the sanctuaries contain examples of almost all the forest types of continental Southeast Asia. They are home to a diverse array of fauna, including 77% of the large mammals (especially elephants and tigers), 50% of the large birds and 33% of the land vertebrates to be found in this region.

Tunisia

■ Ichkeul National Park (N iv: 1980)

The Ichkeul lake and wetland are a major stopover point for hundreds of thousands of migrating birds, such as ducks, geese, storks and pink flamingoes, who come to feed and nest. Ichkeul is the last remaining lake in a chain that once extended across North Africa.

Uganda

■ Rwenzori Mountains National Park (N iii, iv: 1994)

Covering nearly 1,000 km² in western Uganda, the park comprises the main part of the Rwenzori mountain chain, which includes Africa's third highest peak (Mount Margherita: 5,109 m). The region's glaciers, waterfalls and lakes make it one of Africa's most beautiful alpine areas. The park has many natural habitats of endangered species and a rich and unusual flora comprising, among other species, the giant heather.

■ Bwindi Impenetrable National Park (N iii, iv: 1994)

Located in southwestern Uganda, at the junction of the plain and mountain forests, Bwindi Park covers 320 km² and is known for its exceptional biodiversity, with more than 160 species of trees and over 100 species of ferns. Many types of birds and butterflies can also be found there, as well as many endangered species, including the mountain gorilla.

United Kingdom

■ Giant's Causeway and Causeway Coast (N i, iii: 1986)

The Giant's Causeway lies at the foot of the basalt cliffs along the coast on the edge of the Antrim Plateau in Northern Ireland. It is comprised of about 40,000 massive black basalt columns emerging from the sea. The dramatic sight has inspired legends of giants striding over the sea to Scotland. Geological studies of these formations over the last 300 years have greatly contributed to the development of earth sciences, and show that this striking landscape was caused by volcanic activity during the Tertiary, 50-60 million years ago.

■ St Kilda (N iii, iv: 1986)

This volcanic archipelago, with its spectacular landscapes, is situated off the coast of the Hebrides and comprises the islands of Hirta, Dun, Soay and Boreray. It has some of the highest cliffs in Europe, which have large colonies of endangered bird species, including puffins.

■ Henderson Island (N iii, iv: 1988)

This island lies in the eastern South Pacific, one of the few atolls in the world whose ecology has been practically untouched by a human presence. Its isolated location provides the ideal context for

studying the dynamics of insular evolution and natural selection. It is particularly notable for the 10 plants and four land birds that are endemic to the island.

■ **Gough Island Wildlife Reserve (N iii, iv: 1995)**

Gough Island, in the South Atlantic, is one of the least-disrupted island and marine ecosystems in the cool temperate zone. The spectacular cliffs, towering above the ocean, are home to one of the world's largest colonies of sea birds. The island is also home to two endemic species of land birds, the gallinule and the Gough rowettie, as well as to 12 endemic species of plants.

■ **Dorset and East Devon Coast (N i: 2001)**

The cliff exposures along the Dorset and East Devon coast provide an almost continuous sequence of rock formations spanning the Mesozoic Era, or some 185 million years of the Earth's history. The area's important fossil sites and classic coastal geomorphologic features have contributed to the study of earth sciences for over 300 years.

United Republic of Tanzania

■ **Ngorongoro Conservation Area (N ii, iii, iv: 1979)**

A large permanent concentration of wild animals can be found in the huge and perfect Ngorongoro crater. Nearby, are the Empakaai crater, filled by a deep lake, and the active volcano of Oldonyo Lenga. Excavations carried out in the Olduvai Gorge, not far from there, have resulted in the discovery of one of our more distant ancestors, *Homo habilis*. Laitoli Site, which also lies within the area, is one of the main localities of early hominid footprints, dating back 3.6 million years.

■ **Serengeti National Park (N iii, iv: 1981)**

The vast plains of the Serengeti comprise 15000 km² of savannah. The annual migration to permanent water holes of vast herds of herbivores (wildebeest, gazelles and zebras), followed by their predators, is one of the most impressive natural events in the world.

■ **Selous Game Reserve (N ii, iv: 1982)**

Large numbers of elephants, black rhinoceroses, cheetahs, giraffes, hippopotamuses and crocodiles live in this immense sanctuary, which covers 50,000 km². The park has a variety of vegetation zones, ranging from dense thickets to open wooded grasslands.

■ **Kilimanjaro National Park (N iii: 1987)**

At 5,963 m, Mount Kilimanjaro is the highest point in Africa. This volcanic massif stands in splendid isolation above the surrounding plains, with its snowy peak looming over the savannah. The mountain is encircled by mountain forest and numerous mammals, many of them endangered species, live in the park.

United States of America

■ **Yellowstone (N i, ii, iii, iv: 1978)**

The vast natural forest of Yellowstone National Park covers nearly 9,000 km². Yellowstone contains half of all the world's known geothermal features, with more than 10,000 examples. It also has the world's largest concentration of geysers (more than 300). Established in 1872, Yellowstone is equally known for its wildlife, such as grizzly bears, wolves, bison and wapitis.

■ **Grand Canyon National Park (N i, ii, iii, iv: 1979)**

Carved out by the Colorado River, the Grand Canyon (nearly 1,500 m deep) is the most spectacular gorge in the world. Located in Arizona, it cuts across the Grand Canyon National Park. Its horizontal strata retrace the geological history of the past 2 billion years. There are also prehistoric traces of human adaptation to a particularly harsh environment.

■ **Everglades National Park (N i, ii, iv: 1979)**

This site at the southern tip of Florida has been called 'a river of grass flowing imperceptibly from the hinterland into the sea'. The exceptional variety of its water habitats has made it a sanctuary for a large number of birds and reptiles, as well as for threatened species such as the manatee.

■ **Redwood National Park (N ii, iii: 1980)**

Redwood National Park comprises a region of coastal mountains bordering the Pacific Ocean north of San Francisco. It is covered with a magnificent forest of *Sequoia* redwood trees, the tallest and most impressive trees in the world. Important fauna includes sea lions, the bald eagle and the endangered California brown pelican.

■ **Mammoth Cave National Park (N i, iii, iv: 1981)**

Mammoth Cave National Park, located in Kentucky, has the world's largest network of natural caves and underground passageways, characteristic examples of limestone formations. The park and its underground network of more than 560 km of surveyed passageways are home to a varied flora and fauna, including a number of endangered species.

■ **Olympic National Park (N ii, iii: 1981)**

Located in the northwest of Washington State, Olympic National Park is renowned for the diversity of its ecosystems. Glacier-clad peaks interspersed with extensive alpine meadows are surrounded by an extensive old growth forest, among which is the best example of intact and protected temperate rainforest in the Pacific Northwest. Eleven major river systems drain the Olympic Mountains, offering some of the best habitat for anadromous fish species in the country. The park also includes 100 km of wilderness coastline, the longest undeveloped coast in the contiguous United States, and is rich in native and endemic animal and plant species, including critical populations of the endangered northern spotted owl, marbled murrelet and bull trout.

■ **Great Smoky Mountains National Park (N i, ii, iii, iv: 1983)**

Covering more than 2,000 km², this exceptionally beautiful park is home to more than 3,500 plant species, including almost as many trees (130 natural species) as in all of Europe. Many endangered animal species are also found there, including what is probably the greatest variety of salamanders in the world. The park is indicative of temperate flora before the influence of humankind.

■ **Yosemite National Park (N i, ii, iii: 1984)**

Yosemite National Park lies in the heart of California. With its 'hanging' valleys, many waterfalls, cirque lakes, polished domes, moraines and U-shaped valleys, it provides an excellent overview of all kinds of granite relief fashioned by glaciation. At 600-4,000 m, a great variety of flora and fauna can also be found here.

■ **Hawaii Volcanoes National Park (N ii: 1987)**

Two of the most active volcanoes in the world, Mauna Loa (4,170 m high) and Kilauea (1,250 m high), tower over the Pacific Ocean at this site and volcanic eruptions have created a constantly changing landscape. Rare birds and endemic species also occur, as well as forests of giant ferns.

■ **Carlsbad Caverns National Park (N i, iii: 1995)**

This karst landscape in New Mexico comprises over 80 recognized caves. They are outstanding not only for their size but also for the profusion, diversity and beauty of their mineral formations. Lechuguilla Cave stands out from the others, providing an underground laboratory for the study of geological and biological processes.

Venezuela

■ **Canaima National Park (N i, ii, iii, iv: 1994)**

Canaima National Park extends over 30,000 km² in southeastern Venezuela along the border with Guyana and Brazil. Roughly 65% of the park is covered by table mountain (*tepui*) formations. The tepuis constitute a unique biogeological entity and are of great geological interest. The sheer cliffs and waterfalls, including the world's highest (1,000 m), form a spectacular landscape.

Viet Nam

■ **Ha Long Bay (N i, iii: 1994, 2000)**

Ha Long Bay, in the Gulf of Tonkin, includes 1,600 islands and islets, forming a spectacular seascape of limestone pillars. Because of their precipitous nature, most of the islands are uninhabited. The site's outstanding scenic beauty is complemented by its great biological interest.

■ **Phong Nha-Ke Bang National Park (N i: 2003)**

The vast area of dramatic, forested highland karst landscape extending to the border of the Lao People's Democratic Republic is geologically very diverse and includes spectacular formations including 65 kilometres of caves and underground rivers. The reserve is largely covered by tropical forest, with a high level of biodiversity and numerous endemic species.

Zambia and Zimbabwe

■ **Mosi-oa-Tunya/Victoria Falls (N ii, iii: 1989)**

These are among the most spectacular waterfalls in the world. The Zambezi River, which is more than 2 km wide at this point, plunges down a series of basalt gorges and raises an iridescent mist that can be seen more than 20 km away.

Zimbabwe

■ **Mana Pools National Park, Sapi and Chewore Safari Areas (N ii, iii, iv: 1984)**

On the banks of the Zambezi, great cliffs overhang the river and the floodplains. The area is home to a remarkable concentration of fauna species, including elephant, buffalo, leopard and cheetah. An important concentration of Nile crocodiles is also be found in the area.

Annex 2: Mixed World Heritage Sites

All sites inscribed on the World Heritage List for their natural values at January 2004 are listed below with brief descriptions⁸, in alphabetical order by country. Within countries sites are listed in chronological order of inscription on the WH List. Note that criteria used are pre-2004 revised Operational Guidelines.

Algeria

■ **Tassili n'Ajjer (N ii, iii; C i, iii: 1982)**

Located in a strange lunar landscape of great geological interest, this site has one of the most important groupings of prehistoric cave art in the world. More than 15,000 drawings and engravings record the climatic changes, the animal migrations and the evolution of human life on the edge of the Sahara from 6000 BC to the first centuries of the present era. The geological formations are of outstanding scenic interest, with eroded sandstones forming 'forests of rock'.

Australia

■ **Kakadu National Park (N ii, iii, iv; C i, vi: 1981, 1987, 1992)**

This unique reserve located in the Northern Territory has been inhabited continuously for more than 40,000 years. The cave paintings, rock carvings and archaeological sites record the skills and way of life of the region's inhabitants, from the hunter-gatherers of prehistoric times to the Aboriginal people still living there. It is a unique example of a complex of ecosystems, including tidal flats, floodplains, lowlands and plateaux, and provides a habitat for a wide range of rare or endemic species of plants and animals.

■ **Willandra Lakes Region (N i; C iii: 1981)**

The fossil remains of a series of lakes and sand formations that date from the Pleistocene can be found in this region, together with archaeological evidence of human occupation dating from 45,000-60,000 years ago. It is a unique landmark in the study of human evolution on the Australian continent. Several well-preserved fossils of giant marsupials have also been found here.

■ **Tasmanian Wilderness (N i, ii, iii, iv; C iii, iv, vi: 1982, 1989)**

In a region that has been subjected to severe glaciation, the parks and reserves that comprise the Wilderness, with their steep gorges, covering an area of over 10,000 km², constitute one of the last expanses of temperate rainforest in the world. Remains found in limestone caves attest to the human occupation of the area for more than 20,000 years.

■ **Uluru-Kata Tjuta National Park (N ii, iii; C v, vi: 1987, 1994)**

This park, formerly called Uluru (Ayers Rock-Mount Olga) National Park, features spectacular geological formations that dominate the vast red sandy plain of central Australia. Uluru, an immense monolith, and Kata Tjuta, the rock domes located west of Uluru, form part of the traditional belief system of one of the oldest human societies in the world. The traditional owners of Uluru-Kata Tjuta are the Anangu Aboriginal people.

⁸ Adapted from the UNESCO World Heritage Centre online: <http://whc.unesco.org/pg.cfm?cid=31>

China

■ Mount Taishan (N iii; C i, ii, iii, iv, v, vi: 1987)

The sacred Mount Tai was the object of an imperial cult for nearly 2,000 years, and the artistic masterpieces found there are in perfect harmony with the natural landscape. It has always been a source of inspiration for Chinese artists and scholars and symbolizes ancient Chinese civilizations and beliefs.

■ Mount Huangshan (N iii, iv; C ii: 1990)

Huangshan, known as 'the loveliest mountain of China', was acclaimed through art and literature during a good part of Chinese. Today it holds the same fascination for visitors, poets, painters and photographers who come on pilgrimage to the site, which is renowned for its magnificent scenery made up of many granite peaks and rocks emerging out of a sea of clouds.

■ Mount Emei Scenic Area, including Leshan Giant Buddha Scenic Area (N iv; C iv, vi: 1996)

The first Buddhist temple in China was built here in Sichuan Province in the 1st century A.D. atop Mount Emei. The addition of other temples turned the site into one of Buddhism's main holy places. Over the centuries, the cultural treasures grew in number. The most remarkable was the Giant Buddha of Leshan, carved out of a hillside in the 8th century and looking down on the confluence of three rivers. At 71 m high, it is the largest Buddha in the world. Mount Emei is also notable for its very diverse vegetation, ranging from subtropical to subalpine pine forests. Some of the trees are more than 1,000 years old.

■ Mount Wuyi (N iii, iv; C iii, vi: 1999)

Mount Wuyi is the most outstanding area for biodiversity conservation in southeast China and a refuge for a large number of ancient, relict species, many of them endemic to China. The serene beauty of the dramatic gorges of the Nine Bend River, with its numerous temples and monasteries, many now in ruins, provided the setting for the development and spread of neo-Confucianism, which has been influential in the cultures of East Asia since the 11th century. In the 1st century B.C. a large administrative capital was built at nearby Chengcun by the Han dynasty rulers. Its massive walls enclose an archaeological site of great significance.

France and Spain

■ Pyrénées-Mont Perdu (N i, iii; C iii, iv, v: 1997, 1999)

This outstanding mountain landscape, which spans the contemporary national borders of France and Spain, is centred around the peak of Mount Perdu, a calcareous massif that rises to 3,352 m. The site, with a total area of 306 km², includes two of Europe's largest and deepest canyons on the Spanish side and three major cirque walls on the more abrupt northern slopes with France, classic presentations of these geological landforms. The site is also a pastoral landscape reflecting an agricultural way of life that was once widespread in the upland regions of Europe but now survives only in this part of the Pyrénées. It provides exceptional insights into past European society through its landscape of villages, farms, fields, upland pastures and mountain roads.

Greece

■ Mount Athos (N iii; C i, ii, iv, v, vi: 1988)

An Orthodox spiritual centre since 1054, Mount Athos has had an autonomous statute since Byzantine times. The 'Holy Mountain', which is forbidden to women and children, is also a

recognized artistic site. The layout of the monasteries (about 20 of which are presently inhabited by some 1,400 monks) had an influence as far afield as Russia, and its school of painting influenced the history of Orthodox art.

■ **Meteora (N iii; C i, ii, iv, v: 1988)**

In a region of almost inaccessible sandstone peaks, monks settled on these 'columns of the sky' from the 11th century onwards. Twenty-four of these monasteries were built at the time of the great revival of the Eremetic ideal in the 15th century. Their 16th century frescoes mark a key stage in the development of post-Byzantine painting.

Guatemala

■ **Tikal National Park (N ii, iv: C i, iii, iv: 1979)**

Surrounded by lush vegetation, Tikal is one of the major sites of Mayan civilization, inhabited from the 6th century B.C. to the 10th century A.D. The ceremonial centre contains superb temples and palaces, and public squares accessed by means of ramps. Remains of dwellings are scattered throughout the surrounding countryside.

Macedonia, Former Yugoslav Republic of

■ **Ohrid Region with its Cultural and Historical Aspect and its Natural Environment (N iii; C i, iii, iv: 1979, 1980)**

Situated on the shores of Lake Ohrid, the town of Ohrid is one of the oldest human settlements in Europe. Built mainly between the 7th and 19th centuries, it has the oldest Slav monastery (St Pantelejmon) and more than 800 Byzantine-style icons dating from the 11th to the end of the 14th century. After those of the Tretiakov Gallery in Moscow, this is considered to be the most important collection of icons in the world.

Mali

■ **Cliff of Bandiagara (Land of the Dogons) (N iii; C v: 1989)**

The Bandiagara site is an outstanding landscape of cliffs and sandy plateaux with beautiful architecture (houses, granaries, altars, sanctuaries and Togu Na, or communal meeting-places). Several age-old social traditions live on in the region (masks, feasts, rituals, and ceremonies involving ancestor worship). The geological, archaeological and ethnological interest, together with the landscape, make the Bandiagara plateau one of West Africa's most impressive sites.

New Zealand

■ **Tongariro National Park (N ii, iii; C vi: 1990, 1993)**

In 1993 Tongariro became the first property to be inscribed on the World Heritage List under the revised criteria describing cultural landscapes. The volcanic mountains at the heart of the park have cultural and religious significance for the Maori people and symbolize the spiritual links between this community and its environment. The park has active and extinct volcanoes, a diverse range of ecosystems and spectacular landscapes.

Peru

■ Historic Sanctuary of Machu Picchu (N ii, iii; C i, iii: 1983)

Machu Picchu stands 2,430 m above sea level, in tropical mountain forest. It was an amazing urban creation of the Inca Empire at its height. The natural setting, on the eastern slopes of the Andes, encompasses the upper Amazon basin with its rich diversity of flora and fauna.

■ Río Abiseo National Park (N ii, iii, iv; C iii: 1990, 1992)

The park was created in 1983 to protect the fauna and flora of the rainforests that are characteristic of this region of the Andes. There is a high level of endemism among the fauna and flora found in the park. The yellow-tailed woolly monkey, previously thought extinct, is found only in this area. Research undertaken since 1985 has already uncovered 36 previously unknown archaeological sites at altitudes of between 2,500 and 4,000 m, which an understanding of pre-Inca society.

South Africa

■ uKhahlamba/Drakensberg Park (N iii, iv; C i, iii: 2000)

The uKhahlamba-Drakensberg Park has exceptional natural beauty in its basaltic buttresses, incisive cutbacks, sandstone ramparts, high altitude grasslands, steep-sided river valleys and rocky gorges. The site's diversity of habitats protects a high level of endemic and globally threatened species, especially birds and plants. The site also contains many caves and rock-shelters, with the largest and most concentrated group of paintings in Africa south of the Sahara, made by the San people over a period of 4,000 years. The rock paintings are outstanding in quality and diversity of subject and in their depiction of animals and human beings. They represent the spiritual life of the San people who no longer live in this region.

Spain

■ Ibiza, Biodiversity and Culture (N ii, iv; C ii, iii, iv: 1999)

Ibiza provides an excellent example of the interaction between marine and coastal ecosystems. Dense prairies of *Posidonia* seagrass, an important endemic species found only in the Mediterranean basin, contain and support a diversity of marine life. Ibiza preserves considerable evidence of its long history. The archaeological sites at Sa Caleta (settlement) and Puig des Molins (necropolis) testify to the important role played by the island in the Mediterranean economy in protohistory, particularly during the Phoenician-Carthaginian period. The fortified Upper Town (Alta Vila) is an outstanding example of Renaissance military architecture; it had a profound influence on the development of fortifications in the Spanish settlements of the New World.

Sweden

■ Laponian Area (N i, ii, iii; C iii, v: 1996)

The Arctic Circle region of northern Sweden is the home of the Saami, or Lapp people. It is the largest area in the world with an ancestral way of life based on the seasonal movement of livestock. Every summer, the Saami lead their huge herds of reindeer towards the mountains through a natural landscape, now threatened by the advent of motor vehicles. Historical and ongoing geological processes can be seen in the glacial moraines and changing watercourses.

Turkey

■ Göreme National Park and the Rock Sites of Cappadocia (N iii; C i, iii, v: 1985)

In a spectacular landscape, entirely sculptured by erosion, the Göreme valley and its surroundings contain rock-hewn sanctuaries that provide unique evidence of Byzantine art in the post-Iconoclastic period. Dwellings, troglodyte villages and underground towns - the remains of a traditional human habitat dating back to the 4th century - can also be seen there.

■ Hierapolis-Pamukkale (N iii; C iii, iv: 1988)

Deriving from springs in a cliff almost 200 m high overlooking the plain, calcite-laden waters have created at Pamukkale (Cotton Palace) a landscape comprised of mineral forests, petrified waterfalls and a series of terraced basins. At the end of the 2nd century B.C. the dynasty of the Attalids, the kings of Pergamon, established the thermal spa of Hierapolis. The ruins of the baths, temples and other Greek monuments can be seen at the site.

Annex 3: Background to Global Land Cover Characterization Database

The U.S. Geological Survey (USGS), the University of Nebraska-Lincoln (UNL), and the European Commission's Joint Research Centre (JRC) have generated a 1 km resolution Global Land Cover Characteristics database for use in a wide range of environmental research and modeling applications. The global land cover characteristics database was developed on a continent-by-continent basis. All continental databases share the same map projections (Interrupted Goode Homolosine and Lambert Azimuthal Equal Area), have 1 km nominal spatial resolution, and are based on 1-km Advanced Very High Resolution Radiometer (AVHRR) data spanning April 1992 through March 1993. Each database contains unique elements based on the geographic aspects of the specific continent. In order to provide flexibility for a variety of applications, a core set of derived thematic maps produced through the aggregation of seasonal land cover regions are included in each continental database. The continental databases are combined to make seven global data sets, each representing a different landscape based on a particular classification legend. The global data sets are also available in two map projections (Interrupted Goode Homolosine and Geographic). There are now two versions of the Global Land Cover Characteristics database available. The first version (Version 1.2) of the Global Land Cover Characteristics database was released to the public in November, 1997. Version 1.2 was produced as an International Geosphere Biosphere Programme-Data and Information System (IGBP-DIS) initiative lead by the Land Cover Working Group and has been subjected to a formal accuracy assessment (the IGBP DISCover classification). Since this version was released, over 200 gigabytes of land cover data have been distributed from the EROS Data Centre's anonymous ftp site. Many of the users of the land cover data set have provided feedback (that is, suggestions for additions and improvements). A revised version of the database (Version 2.0) is now available. A formal accuracy assessment has not been conducted for the revised land cover data.

This effort is part of the National Aeronautic's and Space Administration (NASA) Earth Observing System Pathfinder Program. Funding for the project was provided by the USGS, NASA, the U.S. Environmental Protection Agency (EPA), National Oceanic and Atmospheric Administration (NOAA), U.S. Forest Service (USFS), and the United Nations Environment Programme. The database has been adopted by the International Geosphere-Biosphere Programme Data and Information System office (IGBP-DIS) to fill its requirement for a global 1 km land cover data set. All data used or generated during the course of the project (source, interpretations, attributes, and derived data), unless protected by copyrights or trade secret agreements, are distributed through the Earth Resources Observation System (EROS) Data Center (LP) Distributed Active Archive Center (DAAC) for land processes data.

Source: GLCC Home Page <http://edcdaac.usgs.gov/glcc/background.asp>

Table A3.1: GLCC Habitat Descriptions with equivalents in the UNEP-WCMC and IUCN Systems

GLCC CODE	OLSON_GLCC description	OLSON_WCMC description	IUCN_WCMC (nearest equivalent to IUCN/SSC system)
1	Urban	Urban	11. Artificial - Terrestrial
2	Low Sparse Grassland	Low Sparse Grassland	4. Grassland
3	Coniferous Forest	Coniferous Forest	1.1. Forest (Temperate and boreal needleleaf)
4	Deciduous Conifer Forest	Deciduous Conifer Forest	1.1. Forest (Temperate and boreal needleleaf)
5	Deciduous Broadleaf Forest	Deciduous Broadleaf Forest	1.2. Forest (Temperate broadleaf and mixed)
5	Deciduous Broadleaf Forest	Deciduous Broadleaf Forest (tropics)	1.4. Forest (Tropical dry)
6	Evergreen Broadleaf Forests	Evergreen Broadleaf Forests	1.2. Forest (Temperate broadleaf and mixed)
6	Evergreen Broadleaf Forests	Evergreen Broadleaf Forests (tropics)	1.3. Forest (Tropical moist)
7	Tall Grasses and Shrubs	Tall Grasses and Shrubs	4. Grassland
8	Bare Desert	Bare Desert	8. Desert
9	Upland Tundra	Upland Tundra	4. Grassland
10	Irrigated Grassland	Irrigated Grassland	4. Grassland
11	Semi Desert	Semi Desert	8. Desert
12	Glacier Ice	Glacier Ice	8. Desert
13	Wooded Wet Swamp	Wooded Wet Swamp (tropics)	1.3. Forest (Tropical moist)
14	Inland Water	Inland Water	5. Wetlands (inland)
15	Sea Water	Sea Water	9. Sea
16	Shrub Evergreen	Shrub Evergreen	3. Shrubland
17	Shrub Deciduous	Shrub Deciduous	3. Shrubland
19	Evergreen Forest and Fields	Evergreen Forest and Fields	11. Artificial - Terrestrial
20	Cool Rain Forest	Cool Rain Forest	1.1. Forest (Temperate and boreal needleleaf)
21	Conifer Boreal Forest	Conifer Boreal Forest	1.1. Forest (Temperate and boreal needleleaf)
22	Cool Conifer Forest	Cool Conifer Forest	1.1. Forest (Temperate and boreal needleleaf)
23	Cool Mixed Forest	Cool Mixed Forest	1.2. Forest (Temperate broadleaf and mixed)
24	Mixed Forest	Mixed Forest	1.2. Forest (Temperate broadleaf and mixed)
25	Cool Broadleaf Forest	Cool Broadleaf Forest	1.2. Forest (Temperate broadleaf and mixed)
26	Deciduous Broadleaf Forest	Deciduous Broadleaf Forest	1.2. Forest (Temperate broadleaf and mixed)
27	Conifer Forest	Conifer Forest	1.1. Forest (Temperate and boreal needleleaf)
27	Conifer Forest	Conifer Forest (tropics)	1.4. Forest (Tropical dry)
28	Montane Tropical Forests	Montane Tropical Forests (tropics)	1.3. Forest (Tropical moist)
29	Seasonal Tropical Forest	Seasonal Tropical Forest (tropics)	1.4. Forest (Tropical dry)
30	Cool Crops and Towns	Cool Crops and Towns	11. Artificial - Terrestrial
31	Crops and Town	Crops and Town	11. Artificial - Terrestrial
32	Dry Tropical Woods	Dry Tropical Woods (tropics)	1.4. Forest (Tropical dry)
33	Tropical Rainforest	Tropical Rainforest (tropics)	1.3. Forest (Tropical moist)
34	Tropical Degraded Forest	Tropical Degraded Forest	11. Artificial - Terrestrial
35	Corn and Beans Cropland	Corn and Beans Cropland	11. Artificial - Terrestrial
36	Rice Paddy and Field	Rice Paddy and Field	12. Artificial - Aquatic
37	Hot Irrigated Cropland	Hot Irrigated Cropland	12. Artificial - Aquatic
38	Cool Irrigated Cropland	Cool Irrigated Cropland	12. Artificial - Aquatic

40	Cool Grasses and Shrubs	Cool Grasses and Shrubs	4. Grassland
41	Hot and Mild Grasses and Shrubs	Hot and Mild Grasses and Shrubs	4. Grassland
42	Cold Grassland	Cold Grassland	4. Grassland
43	Savanna (Woods)	Savanna (Woods)	2. Savanna
44	Mire, Bog, Fen	Mire, Bog, Fen	5. Wetlands (inland)
45	Marsh Wetland	Marsh Wetland	5. Wetlands (inland)
46	Mediterranean Scrub	Mediterranean Scrub	3. Shrubland
47	Dry Woody Scrub	Dry Woody Scrub	3. Shrubland
50	Sand Desert	Sand Desert	8. Desert
51	Semi Desert Shrubs	Semi Desert Shrubs	8. Desert
52	Semi Desert Sage	Semi Desert Sage	8. Desert
53	Barren Tundra	Barren Tundra	8. Desert
54	Cool Southern Hemisphere Mixed Forests	Cool Southern Hemisphere Mixed Forests	1.2. Forest (Temperate broadleaf and mixed)
55	Cool Fields and Woods	Cool Fields and Woods	11. Artificial - Terrestrial
56	Forest and Field	Forest and Field	11. Artificial - Terrestrial
57	Cool Forest and Field	Cool Forest and Field	11. Artificial - Terrestrial
58	Fields and Woody Savanna	Fields and Woody Savanna	11. Artificial - Terrestrial
59	Succulent and Thorn Scrub	Succulent and Thorn Scrub	3. Shrubland
60	Small Leaf Mixed Woods	Small Leaf Mixed Woods	1.2. Forest (Temperate broadleaf and mixed)
61	Deciduous and Mixed Boreal Forest	Deciduous and Mixed Boreal Forest	1.2. Forest (Temperate broadleaf and mixed)
62	Narrow Conifers	Narrow Conifers	1.1. Forest (Temperate and boreal needleleaf)
63	Wooded Tundra	Wooded Tundra	1.1. Forest (Temperate and boreal needleleaf)
64	Heath Scrub	Heath Scrub	3. Shrubland
69	Polar and Alpine Desert	Polar and Alpine Desert	8. Desert
72	Mangrove	Mangrove (tropics)	1.3. Forest (Tropical moist)
76	Crop and Water Mixtures	Crop and Water Mixtures	12. Artificial - Aquatic
78	Southern Hemisphere Mixed Forest	Southern Hemisphere Mixed Forest	1.2. Forest (Temperate broadleaf and mixed)
79	Wet Sclerophyllic Forest	Wet Sclerophyllic Forest	1.2. Forest (Temperate broadleaf and mixed)
79	Wet Sclerophyllic Forest	Wet Sclerophyllic Forest (tropics)	1.4. Forest (Tropical dry)
89	Moist Eucalyptus	Moist Eucalyptus	1.2. Forest (Temperate broadleaf and mixed)
89	Moist Eucalyptus	Moist Eucalyptus (tropics)	1.4. Forest (Tropical dry)
90	Rain Green Tropical Forest	Rain Green Tropical Forest (tropics)	1.3. Forest (Tropical moist)
91	Woody Savanna	Woody Savanna	2. Savanna
92	Broadleaf Crops	Broadleaf Crops	11. Artificial - Terrestrial
93	Grass Crops	Grass Crops	11. Artificial - Terrestrial
94	Crops, Grass, Shrubs	Crops, Grass, Shrubs	11. Artificial - Terrestrial
95	Evergreen Tree Crop	Evergreen Tree Crop	11. Artificial - Terrestrial
96	Deciduous Tree Crop	Deciduous Tree Crop	11. Artificial - Terrestrial
99	< no GLCC code >	Caspian Sea	9. Sea
100	Missing Data	Missing Data	13. Missing data

Table A3.2: Area of Olson/GLCC Habitat Types in World Heritage Sites

GLCC Code	Olson /GLCC Habitat Type	Global Area (km ²)	Area in WH Sites (km ²)	% of Global Habitat in WH Sites
15	Sea Water	362,340,284	465,669	0.13%
12	Glacier Ice	16,654,389	51,382	0.31%
8	Bare Desert	16,210,069	212,123	1.31%
33	Tropical Rainforest	9,617,023	165,439	1.72%
51	Semi Desert Shrubs	9,217,248	29,248	0.32%
91	Woody Savannah	7,760,308	83,268	1.07%
43	Savannah (Woods)	7,611,592	55,859	0.73%
31	Crops and Town	5,327,379	33,808	0.63%
93	Grass Crops	4,298,362	8,015	0.19%
9	Upland Tundra	3,548,312	55,557	1.57%
2	Low Sparse Grassland	3,473,647	15,908	0.46%
58	Fields and Woody Savannah	3,459,820	20,752	0.60%
41	Hot and Mild Grasses and Shrubs	3,415,006	14,827	0.43%
94	Crops, Grass, Shrubs	3,344,778	6,579	0.20%
63	Wooded Tundra	2,840,339	26,078	0.92%
23	Cool Mixed Forest	2,806,561	20,884	0.74%
21	Conifer Boreal Forest	2,703,351	34,435	1.27%
14	Inland Water	2,651,174	58,173	2.19%
47	Dry Woody Scrub	2,569,060	6,931	0.27%
36	Rice Paddy and Field	2,415,622	3,873	0.16%
42	Cold Grassland	2,241,653	28,807	1.29%
60	Small Leaf Mixed Woods	2,217,372	51,896	2.34%
11	Semi Desert	2,213,111	3,067	0.14%
53	Barren Tundra	2,093,354	12,561	0.60%
4	Deciduous Conifer Forest	1,960,544	5,200	0.27%
62	Narrow Conifers	1,847,393	21,677	1.17%
61	Deciduous and Mixed Boreal Forest	1,457,888	12,288	0.84%
40	Cool Grasses and Shrubs	1,401,978	5,154	0.37%
22	Cool Conifer Forest	1,395,030	23,387	1.68%
29	Seasonal Tropical Forest	1,385,165	25,791	1.86%
56	Forest and Field	1,376,380	3,723	0.27%
17	Shrub Deciduous	1,364,457	9,647	0.71%
32	Dry Tropical Woods	1,245,057	20,616	1.66%
24	Mixed Forest	1,244,613	7,719	0.62%
30	Cool Crops and Towns	1,186,607	136	0.01%
19	Evergreen Forest and Fields	1,139,218	13,778	1.21%
57	Cool Forest and Field	1,068,032	2,033	0.19%
55	Cool Fields and Woods	1,025,172	1,317	0.13%
35	Corn and Beans Cropland	964,866	1,825	0.19%
44	Mire, Bog, Fen	795,366	2,262	0.28%
25	Cool Broadleaf Forest	723,092	951	0.13%
59	Succulent and Thorn Scrub	706,571	3,091	0.44%
27	Conifer Forest	653,994	1,311	0.20%
52	Semi Desert Sage	619,706	902	0.15%
34	Tropical Degraded Forest	555,916	7,721	1.39%
16	Shrub Evergreen	503,295	6,405	1.27%
5	Deciduous Broadleaf Forest	471,221	2,535	0.54%
37	Hot Irrigated Cropland	440,016	77	0.02%
26	Deciduous Broadleaf Forest	427,032	374	0.09%
90	Rain Green Tropical Forest	414,452	1,383	0.33%

99	Caspian Sea	374,619	0	0.00%
46	Mediterranean Scrub	335,483	37	0.01%
92	Broadleaf Crops	290,329	927	0.32%
1	Urban	261,514	150	0.06%
78	Southern Hemisphere Mixed Forest	246,551	5,476	2.22%
38	Cool Irrigated Cropland	233,325	890	0.38%
6	Evergreen Broadleaf Forests	216,425	13,133	6.07%
28	Montane Tropical Forests	207,050	3,702	1.79%
89	Moist Eucalyptus	193,335	8,608	4.45%
10	Irrigated Grassland	182,890	91	0.05%
64	Heath Scrub	138,145	544	0.39%
54	Cool Southern Hemisphere Mixed Forests	128,790	986	0.77%
50	Sand Desert	122,745	48	0.04%
79	Wet Sclerophytic Forest	107,002	13,863	12.96%
20	Cool Rain Forest	95,730	1,474	1.54%
13	Wooded Wet Swamp	86,143	3,642	4.23%
76	Crop and Water Mixtures	84,069	0	0.00%
100	Missing Data	80,075	10,273	12.83%
95	Evergreen Tree Crop	75,145	61	0.08%
96	Deciduous Tree Crop	69,662	270	0.39%
45	Marsh Wetland	62,029	30	0.05%
69	Polar and Alpine Desert	51,211	1,082	2.11%
72	Mangrove	48,894	1,387	2.84%
7	Tall Grasses and Shrubs	37,822	0	0.00%
3	Coniferous Forest	23,761	3	0.01%

Note: These data are presented for information purposes only, and because of the short-comings of the GLCC dataset it is not considered that the data in this table merit further review.

Annex 4: Background to IUCN/SSC Habitat Classification

This classification (now as Version 2.1) is based on the Global Land Cover Characterization (GLCC) developed by the US Geological Survey's (USGS) Earth Resources Observation System (EROS) Data Center, the University of Nebraska-Lincoln (UNL) and the Joint Research Centre of the European Commission (see <http://edcdaac.usgs.gov/glcc/glcc.html>). The GLCC is a database of global land cover characteristics at a 1-km resolution, which can be used in a wide range of environmental research and modelling applications. The SSC has adopted a modified version of the GLCC as a standard means of recording global habitat types for taxa on the IUCN Red List and in the Species Information Service (SIS). The main modification to the system is the inclusion of additional aquatic habitats (marine, inland and artificial), based primarily on the classification system of wetland types used by the Ramsar Convention (see http://www.ramsar.org/key_ris_types.htm). The habitat/land cover classification is embedded within a hierarchy derived from Holdridge's Life Zones scheme, which uses more familiar and user-friendly biogeographic or climatic terms. The categories are numbered to indicate their level in the hierarchy e.g., 1. Forest, 1.1 Boreal, 1.1.1. Coniferous Forest. The descriptors of the habitat types at level three, are based on the Global Ecosystem Framework developed by Jerry Olson for the GLCC. Olson has defined 94 ecosystem classes that are based on their land cover mosaic, floristic properties, climate, and physiognomy. The number in parenthesis after each descriptor is the GLCC classification number.

The habitats in which a taxon is found should be indicated by means of a simple scoring system:

- 1 Suitable (main or preferred habitat/s, habitat/s containing major subpopulations, habitat/s with high population densities).
- 2 Moderately suitable (secondary habitat(s), habitat(s) containing minor subpopulations, habitat(s) with low population densities).
- 3 Unsuitable (unsuitability expressly known or easily inferred from the ecology of the taxon).
- 9 Undefined (data deficient, possibly suitable or moderately suitable as inferred from the ecology of the taxon)

It is important to note that if a higher level in the hierarchy is scored, this automatically implies that all the habitat types nested below that level are also scored (e.g. scoring Boreal, means that all the Boreal forest types i.e. 1.1.1 to 1.1.17, are scored). This will not be the intention in most cases. Users are therefore encouraged to select the appropriate habitat type from the lowest level in the hierarchy wherever possible, using the higher level categories as a guide.

It is not mandatory, to score habitat preferences at the third level (i.e. the GLCC level) of the hierarchy, especially if you do not have access to the GLCC maps to verify your selection spatially. Users without access to the GLCC maps are strongly advised to limit their selections of habitats to the first two levels of the hierarchy. (The GLCC maps can be downloaded from the USGS web site: <http://edcdaac.usgs.gov/glcc/glcc.html>).

If 'Other' is selected, the habitat type must be specified. Multiple additions under 'Other' are allowed, although extensive use of this is not encouraged. If the habitat is not known, please indicate this using a score of 9 under category 15 Unknown.

Habitat Types

Numbers in brackets refer to equivalent habitats in Olson's GLCC habitat scheme. It should be noted that an Olson habitat can be categorised under more than one IUCN Level 3 habitat. For example, IUCN habitats 1.1.16 Boreal Wooded Tundra and 1.2.8 Subarctic Wooded Tundra are both equivalent to Olson Habitat 63 = Wooded Tundra.

1. Forest

1.1. Boreal

- 1.1.1. Coniferous Forest (3)
- 1.1.2. Deciduous Coniferous Forest (4)
- 1.1.3. Deciduous Broadleaf Wood (5)
- 1.1.4. Evergreen Forest and Fields (19)
- 1.1.5. Cool Rain Forest (20)
- 1.1.6. Conifer Boreal Forest (21)
- 1.1.7. Cool Conifer Forest (22)
- 1.1.8. Cool Mixed Forest (23)
- 1.1.9. Cool Broadleaf Forest (25)
- 1.1.10. Cool Southern Hemisphere Mixed Forest (54)
- 1.1.11. Forest and Field (56)
- 1.1.12. Cool Forest and Field (57)
- 1.1.13. Small Leaf Mixed Woods (60)
- 1.1.14. Deciduous and Mixed Boreal Forest (61)
- 1.1.15. Narrow Conifers (62)
- 1.1.16. Wooded Tundra (63)
- 1.1.17. Southern Hemisphere Mixed Forest (78)

1.2. Subarctic

- 1.2.1. Coniferous Forest (3)
- 1.2.2. Deciduous Coniferous Forest (4)
- 1.2.3. Conifer Boreal Forest (21)
- 1.2.4. Cool Conifer Forest (22)
- 1.2.5. Small Leaf Mixed Woods (60)
- 1.2.6. Deciduous and Mixed Boreal Forest (61)
- 1.2.7. Narrow Conifers (62)
- 1.2.8. Wooded Tundra (63)

1.3. Subantarctic

1.4. Temperate

- 1.4.1. Coniferous Forest (3)
- 1.4.2. Deciduous Broadleaf Wood (5)
- 1.4.3. Evergreen Broadleaf Forest (6)
- 1.4.4. Evergreen Forest and Fields (19)
- 1.4.5. Cool Rain Forest (20)
- 1.4.6. Conifer Boreal Forest (21)
- 1.4.7. Cool Conifer Forest (22)
- 1.4.8. Cool Mixed Forest (23)
- 1.4.9. Mixed Forest (24)
- 1.4.10. Cool Broadleaf Forest (25)
- 1.4.11. Deciduous Broadleaf Forest (26)
- 1.4.12. Conifer Forest (27)
- 1.4.13. Montane Tropical Forest (28)
- 1.4.14. Cool Southern Hemisphere Mixed Forest (54)
- 1.4.15. Forest and Field (56)

- 1.4.16. Cool Forest and Field (57)
- 1.4.17. Small Leaf Mixed Woods (60)
- 1.4.18. Deciduous and Mixed Boreal Forest (61)
- 1.4.19. Southern Hemisphere Mixed Forest (78)
- 1.4.20. Wet Sclerophytic Forest (79)
- 1.4.21. Moist Eucalyptus (89)
- 1.4.22. Rain Green Tropical Forest (90)
- 1.5. Subtropical/Tropical Dry
 - 1.5.1. Evergreen Broadleaf Forest (6)
 - 1.5.2. Wooded Wet Swamp (13)
 - 1.5.3. Evergreen Forest and Fields (19)
 - 1.5.4. Mixed Forest (24)
 - 1.5.5. Conifer Forest (27)
 - 1.5.6. Seasonal Tropical Forest (29)
 - 1.5.7. Tropical Rainforest (33)
 - 1.5.8. Tropical Degraded Forest (34)
 - 1.5.9. Forest and Field (56)
 - 1.5.10. Southern Hemisphere Mixed Forest (78)
 - 1.5.11. Wet Sclerophytic Forest (79)
 - 1.5.12. Moist Eucalyptus (89)
 - 1.5.13. Rain Green Tropical Forest (90)
- 1.6. Subtropical/Tropical Moist Lowland
 - 1.6.1. Evergreen Broadleaf Forest (6)
 - 1.6.2. Evergreen Forest and Fields (19)
 - 1.6.3. Mixed Forest (24)
 - 1.6.4. Deciduous Broadleaf Forest (26)
 - 1.6.5. Conifer Forest (27)
 - 1.6.6. Montane Tropical Forest (28)
 - 1.6.7. Seasonal Tropical Forest (29)
 - 1.6.8. Dry Tropical Woods (32)
 - 1.6.9. Tropical Rainforest (33)
 - 1.6.10. Tropical Degraded Forest (34)
 - 1.6.11. Forest and Field (56)
 - 1.6.12. Southern Hemisphere Mixed Forest (78)
 - 1.6.13. Wet Sclerophytic Forest (79)
 - 1.6.14. Moist Eucalyptus (89)
 - 1.6.15. Rain Green Tropical Forest (90)
- 1.7. Subtropical/Tropical Mangrove
 - 1.7.1. Mangrove (72)
- 1.8. Subtropical/Tropical Swamp
 - 1.8.1. Wooded Wet Swamp (13)
- 1.9. Subtropical/Tropical Moist Montane

2. Savannah

- 2.1. Dry
 - 2.1.1. Savannah (Woods) (43)
 - 2.1.2. Woody Savannah (91)
- 2.2. Moist
 - 2.2.1. Savannah (Woods) (43)
 - 2.2.2. Woody Savannah (91)

3. Shrubland

- 3.1. Subarctic
 - 3.1.1. Shrub Deciduous (17)
 - 3.1.2. Heath Scrub (64)
- 3.2. Subantarctic
- 3.3. Boreal
 - 3.3.1. Cool Grasses and Shrubs (40)
 - 3.3.2. Heath Scrub (64)
- 3.4. Temperate
 - 3.4.1. Tall Grasses and Shrubs (7)
 - 3.4.2. Shrub Evergreen (16)
 - 3.4.3. Shrub Deciduous (17)
 - 3.4.4. Cool Grasses and Shrubs (40)
 - 3.4.5. Hot and Mild Grasses and Shrubs (41)
 - 3.4.6. Mediterranean Scrub (46)
 - 3.4.7. Dry Woody Scrub (47)
- 3.5. Subtropical/Tropical Dry
 - 3.5.1. Shrub Evergreen (16)
 - 3.5.2. Cool Grasses and Shrubs (40)
 - 3.5.3. Hot and Mild Grasses and Shrubs (41)
 - 3.5.4. Mediterranean Scrub (46)
 - 3.5.5. Dry Woody Scrub (47)
 - 3.5.6. Succulent and Thorn Scrub (59)
- 3.6. Subtropical/Tropical Moist
 - 3.6.1. Shrub Evergreen (16)
 - 3.6.2. Succulent and Thorn Scrub (59)
- 3.7. Subtropical/Tropical High Altitude
- 3.8. Mediterranean-type Shrubby Vegetation

4. Grassland

- 4.1. Tundra
 - 4.1.1. Low Sparse Grassland (2)
 - 4.1.2. Upland Tundra (9)
 - 4.1.3. Cool Grasses and Shrubs (40)
- 4.2. Subarctic
 - 4.2.1. Low Sparse Grassland (2)
 - 4.2.2. Upland Tundra (9)
 - 4.2.3. Cold Grassland (42)
- 4.3. Subantarctic
- 4.4. Temperate
 - 4.4.1. Low Sparse Grassland (2)
 - 4.4.2. Tall Grasses and Shrubs (7)
 - 4.4.3. Cool Grasses and Shrubs (40)
 - 4.4.4. Hot and Mild Grasses and Shrubs (41)
 - 4.4.5. Cold Grassland (42)
- 4.5. Subtropical/Tropical Dry Lowland
 - 4.5.1. Cool Grasses and Shrubs (40)
 - 4.5.2. Hot and Mild Grasses and Shrubs (41)
- 4.6. Subtropical/Tropical Seasonally Wet/Flooded Lowland
 - 4.6.1. Irrigated Grassland (10)
- 4.7. Subtropical/Tropical High Altitude

5. Wetlands (inland)

- 5.1. Permanent Rivers/Streams/Creeks [includes waterfalls]
- 5.2. Seasonal/Intermittent/Irregular Rivers/Streams/Creeks
- 5.3. Shrub Dominated Wetlands
- 5.4. Bogs, Marshes, Swamps, Fens, Peatlands
 - 5.4.1. Mire, Bog, Fen (44)
 - 5.4.2. Marsh Wetland (45)
- 5.5. Permanent Freshwater Lakes [over 8 ha]
- 5.6. Seasonal/Intermittent Freshwater Lakes [over 8 ha]
- 5.7. Permanent Freshwater Marshes/Pools [under 8 ha]
- 5.8. Seasonal/Intermittent Freshwater Marshes/Pools [under 8 ha]
- 5.9. Freshwater Springs and Oases
- 5.10. Tundra Wetlands [includes pools and temporary waters from snowmelt]
- 5.11. Alpine Wetlands [includes temporary waters from snowmelt]
- 5.12. Geothermal Wetlands
- 5.13. Permanent Inland Deltas
- 5.14. Permanent Saline, Brackish or Alkaline Lakes
- 5.15. Seasonal/Intermittent Saline, Brackish or Alkaline Lakes and Flats
- 5.16. Permanent Saline, Brackish or Alkaline Marshes/Pools
- 5.17. Seasonal/Intermittent Saline, Brackish or Alkaline Marshes/Pools
- 5.18. Karst and Other Subterranean Hydrological Systems [inland]

6. Rocky Areas [e.g. inland cliffs, mountain peaks]

7. Caves and Subterranean Habitats (non-aquatic)

- 7.1. Caves
- 7.2. Other Subterranean Habitats

8. Desert

- 8.1. Hot
 - 8.1.1. Bare Desert (8)
 - 8.1.2. Semi Desert (11)
 - 8.1.3. Sand Desert (50)
 - 8.1.4. Semi Desert Shrubs (51)
- 8.2. Temperate
 - 8.2.1. Bare Desert (8)
 - 8.2.2. Semi Desert (11)
 - 8.2.3. Sand Desert (50)
 - 8.2.4. Semi Desert Shrubs (51)
 - 8.2.5. Semi Desert Sage (52)
- 8.3. Cold
 - 8.3.1. Bare Desert (8)
 - 8.3.2. Semi Desert (11)
 - 8.3.3. Glacier Ice (12)
 - 8.3.4. Semi Desert Sage (52)
 - 8.3.5. Barren Tundra (53)
 - 8.3.6. Polar and Alpine Desert (69)

9. Sea

- 9.1. Open
- 9.2. Shallow [usually less than 6 m deep at low tide; includes sea bays and straits]

- 9.3. Subtidal Aquatic Beds [kelp beds, sea- grass beds and tropical marine meadows]
- 9.4. Coral Reefs

10. Coastline

- 10.1. Rocky Shores [includes rocky offshore islands and sea cliffs]
- 10.2. Sand, Shingle or Pebble Shores [includes sand bars, spits, sandy islets, dune systems]
- 10.3. Estuarine Waters
- 10.4. Intertidal Mud, Sand or Salt Flats
- 10.5. Intertidal Marshes [includes salt marshes]
- 10.6. Coastal Brackish/Saline Lagoons
- 10.7. Coastal Freshwater Lagoons
- 10.8. Karst and Other Subterranean Hydrological Systems [marine/coastal]

11. Artificial-Terrestrial

- 11.1. Arable Land
 - 11.1.1. Hot Irrigated Cropland (37)
 - 11.1.2. Corn and Beans Cropland (35)
 - 11.1.3. Broadleaf Crops (92)
 - 11.1.4. Cool Irrigated Cropland (38)
 - 11.1.5. Cool Fields and Woods (55)
 - 11.1.6. Fields and Woody Savannah (58)
 - 11.1.7. Grass Crops (93)
 - 11.1.8. Crops, Grass, Shrubs (94)
- 11.2. Pastureland
 - 11.2.1. Cool Fields and Woods (55)
 - 11.2.2. Fields and Woody Savannah (58)
 - 11.2.3. Grass Crops (93)
 - 11.2.4. Crops, Grass, Shrubs (94)
- 11.3. Plantations
 - 11.3.1. Cool Fields and Woods (55)
 - 11.3.2. Fields and Woody Savannah (58)
 - 11.3.3. Evergreen Tree Crops (95)
 - 11.3.4. Deciduous Tree Crops (96)
- 11.4. Rural Gardens
- 11.5. Urban Areas
 - 11.5.1. Urban (1)
 - 11.5.2. Cool Crops and Towns (30)
 - 11.5.3. Crops and Town (31)
- 11.6. Subtropical/Tropical Heavily Degraded Former Forest

12. Artificial-Aquatic

- 12.1. Water Storage Areas (over 8 ha)
- 12.2. Ponds (below 8 ha)
- 12.3. Aquaculture Ponds
- 12.4. Salt Exploitation Sites
- 12.5. Excavations (open)
- 12.6. Wastewater Treatment Areas
- 12.7. Irrigated Land [includes irrigation channels]
 - 12.7.1. Hot Irrigated Cropland (37)
 - 12.7.2. Cool Irrigated Cropland (38)

- 12.7.3. Rice Paddy and Field (36)
- 12.7.4. Crop and Water Mixtures (76)
- 12.8. Seasonally Flooded Agricultural Land
- 12.9. Canals and Drainage Channels, Ditches
- 12.10. Karst and Other Subterranean Hydrological Systems [human-made]

13. Introduced Vegetation

14. Other

15. Unknown

Table A4.1: Sizes, Dominant IUCN/SSC Habitats and Areas of Largest GLCC Habitats in World Heritage Sites

Country	WH Site	Dominant IUCN/SSC Habitat	Size of Site (km ²)	Area of Largest Habitat	IUCN/SSC Descriptor of Largest Habitat*	% WH Site	Olson GLCC Descriptor of Largest Habitat
Algeria	Tassili N'Ajjer	8.1	99,115	96,570	8. Desert	97.43%	Bare Desert
	Iguazu National Park	5.1	594	561	1.2. Forest (Temperate broadleaf and mixed)	94.47%	Evergreen Broadleaf Forests
Argentina	Ischigualasto - Talampaya Natural Parks	6	2,463	2,097	3. Shrubland	85.13%	Shrub Deciduous
	Los Glaciares	8.3	7,173	2,802	8. Desert	39.07%	Glacier Ice
	Península Valdés	4.4	3,861	2,982	3. Shrubland	77.23%	Shrub Evergreen
	Australian Fossil Mammal Sites (Riversleigh / Naracoorte)	14.7.1	112	83	2. Savanna	74.46%	Savanna (Woods)
	Central Eastern Australian Rainforest	1.6	2,487	1,188	1.2. Forest (Temperate broadleaf and mixed)	47.76%	Wet Sclerophytic Forest
	Fraser Island	1.6	2,400	1,332	1.2. Forest (Temperate broadleaf and mixed)	55.51%	Wet Sclerophytic Forest
	Great Barrier Reef	9.4	340,164	339,223	9. Sea	99.72%	Sea Water
	Heard and McDonald Islands	8.3, 10.1	6,331	5,946	9. Sea	93.92%	Sea Water
Australia	Kakadu National Park	1.5	18,821	14,365	2. Savanna	76.33%	Woody Savanna
	Lord Howe Island Group	1.6	15	11	9. Sea	70.21%	Sea Water
	Macquarie Island	6	5,319	5,190	9. Sea	97.57%	Sea Water
	Purnululu National Park	6	2,401	1,887	2. Savanna	78.59%	Savanna (Woods)
	Shark Bay Western Australia	9.3	22,545	16,741	9. Sea	74.26%	Sea Water
	Tasmanian Wilderness	1.4	15,045	8,729	2. Savanna	58.02%	Woody Savanna
	The Greater Blue Mountains Area	6	10,348	7,415	1.2. Forest (Temperate broadleaf and mixed)	71.66%	Wet Sclerophytic Forest
	Uluru-Kata Tjuta National Park	6	1,255	657	8. Desert	52.38%	Semi Desert Shrubs
	Wet Tropics of Queensland	1.6	7,027	3,804	1.4. Forest (Tropical dry)	54.14%	Wet Sclerophytic Forest
Bangladesh	Willandra Lakes Region	5.5	2,630	982	8. Desert	37.33%	Semi Desert
	The Sundarbans	1.7	1,559	531	9. Sea	34.09%	Sea Water
Belarus/ Poland	Belovezhskaya Pushcha / Bialowieza National Park	1.4	1,351	619	11. Artificial - Terrestrial	45.80%	Crops and Town
Belize	Belize Barrier Reef Reserve System	9.4	1,135	1,129	9. Sea	99.46%	Sea Water
Bolivia	Noel Kempff Mercado National Park	2.1	10,962	8,134	1.3. Forest (Tropical moist)	74.20%	Tropical Rainforest

	Brazilian Atlantic Islands: Fernando de Noronha and Atoll das Rocas Reserves	9.2	2,095	2,073	9. Sea	98.95%	Sea Water
	Central Amazon Conservation Complex	1.6, 1.8	64,424	55,147	1.3. Forest (Tropical moist)	85.60%	Tropical Rainforest
Brazil	Cerrado Protected Areas: Chapada dos Veadeiros and Emas National Parks	2.2	5,488	1,654	2. Savanna	30.14%	Woody Savanna
	Discovery Coast Atlantic Forest Reserves	1.6	22,879	6,346	11. Artificial - Terrestrial	27.74%	Evergreen Forest and Fields
	Iguacu National Park	5.1	1,391	1,022	1.2. Forest (Temperate broadleaf and mixed)	73.47%	Evergreen Broadleaf Forests
	Pantanal Conservation Complex	4.6, 5.4	2,025	722	2. Savanna	35.65%	Woody Savanna
	Southeast Atlantic Forest Reserves	1.6	19,091	3,640	2. Savanna	19.07%	Woody Savanna
	Pirin National Park	1.4	296	77	1.2. Forest (Temperate broadleaf and mixed)	25.99%	Deciduous Broadleaf Forest
	Srebarna Nature Reserve	5.5	11	7	5. Wetlands (inland)	63.78%	Inland Water
Cameroon	Dja Faunal Reserve	1.6	6,264	3,885	1.3. Forest (Tropical moist)	62.03%	Tropical Rainforest
	Canadian Rocky Mountain Parks	6, 8.3	20,407	7,040	1.1. Forest (Temperate and boreal needleleaf)	34.50%	Cool Conifer Forest
	Dinosaur Provincial Park	6	38	32	11. Artificial - Terrestrial	83.98%	Crops, Grass, Shrubs
	Gros Morne National Park	8.3, 10.1	1,894	1,645	1.1. Forest (Temperate and boreal needleleaf)	86.87%	Narrow Conifers
Canada	Miguasha Park	6, 10.1	1	0	11. Artificial - Terrestrial	53.33%	Cool Crops and Towns
	Nahanni National Park	6	5,293	1,569	1.1. Forest (Temperate and boreal needleleaf)	29.64%	Wooded Tundra
	Wood Buffalo National Park	1.1	44,029	29,117	1.2. Forest (Temperate broadleaf and mixed)	66.13%	Small Leaf Mixed Woods
	Glacier and Waterton Lakes National Park (Canadian + US Sections)	1.1, 6	4,949	393	1.1. Forest (Temperate and boreal needleleaf)	7.94%	Cool Conifer Forest
Canada and USA	Tatshenshini-Alsek/Kluane/Wrangell-St Elias/Glacier Bay (Canadian + US Sections)	8.3	104,091	18,478	8. Desert	17.75%	Glacier Ice
Central African Republic	Parc National de Manovo-Gounda-St Floris	2.2	19,179	14,869	2. Savanna	77.52%	Woody Savanna
China	Huanglong Scenic and Historic Interest Area	1.4	151	136	4. Grassland	89.61%	Cold Grassland

	Jiuzhaigou Valley Scenic and Historic Interest Area	1.4	612	484	4. Grassland	79.06%	Cold Grassland
	Mount Emei and Leshan Giant Buddha	1.4	380	117	2. Savanna	30.90%	Woody Savanna
	Mount Huangshan	1.4, 6	205	104	1.2. Forest (Temperate broadleaf and mixed)	50.59%	Mixed Forest
	Mount Taishan	6	268	110	12. Artificial - Aquatic	40.98%	Rice Paddy and Field
	Mount Wuyi	1.4, 1.6	1,148	544	1.1. Forest (Temperate and boreal needleleaf)	47.37%	Conifer Forest
	Three Parallel Rivers of Yunnan Protected Areas	5.1	21,298	6,975	4. Grassland	32.75%	Cold Grassland
	Wulingyuan Scenic and Historic Interest Area	6	395	368	11. Artificial - Terrestrial	93.25%	Crops, Grass, Shrubs
Colombia	Los Katios National Park	1.8	588	307	11. Artificial - Terrestrial	52.22%	Tropical Degraded Forest
Costa Rica	Area de Conservacion Guanacaste	1.5	1,253	434	9. Sea	34.65%	Sea Water
Costa Rica/ Panama	Cocos Island National Park	9.4	1,039	1,017	9. Sea	97.88%	Sea Water
Côte d'Ivoire	Talamanca Range-La Amistad Reserves	1.6	1,968	957	1.3. Forest (Tropical moist)	48.62%	Tropical Rainforest
	Comoé National Park	2.1	11,720	9,221	2. Savanna	78.68%	Savanna (Woods)
	Taï National Park	1.6	4,382	1,710	1.3. Forest (Tropical moist)	39.03%	Tropical Rainforest
Croatia	Pilivice Lakes National Park	5.5	590	459	1.2. Forest (Temperate broadleaf and mixed)	77.88%	Cool Broadleaf Forest
Cuba	Alejandro de Humboldt National Park	1.5, 1.9	708	474	1.2. Forest (Temperate broadleaf and mixed)	66.94%	Mixed Forest
	Desembarco del Granma National Park	10.1	327	175	1.2. Forest (Temperate broadleaf and mixed)	53.65%	Mixed Forest
Democratic Republic of the Congo	Garamba National Park	2.2	4,999	4,597	2. Savanna	91.96%	Woody Savanna
	Kahuzi-Biega National Park	1.6	5,642	1,779	2. Savanna	31.54%	Woody Savanna
	Okapi Faunal Reserve	1.6	13,937	10,246	1.3. Forest (Tropical moist)	73.52%	Tropical Rainforest
	Salonga National Park	1.6, 1.8	34,655	14,947	1.4. Forest (Tropical dry)	43.13%	Seasonal Tropical Forest
	Virunga National Park	1.6, 5.5	7,858	1,667	5. Wetlands (inland)	21.21%	Inland Water
Dominica	Morne Trois Pitons National Park	5.12	67	54	11. Artificial - Terrestrial	80.84%	Grass Crops
Ecuador	Galapagos Islands	6, 9.1	57,198	49,098	9. Sea	85.84%	Sea Water
	Sangay National Park	1.6	5,698	1,574	3. Shrubland	27.62%	Shrub Deciduous
Ethiopia	Simen National Park	4.4	135	37	2. Savanna	27.58%	Woody Savanna
	Cape Girolata, Cape Porto & Scandola Nature Reserves in Corsica	10.1	119	82	9. Sea	68.72%	Sea Water
France/Span	Pyrénées - Monts Perdu (French +	6	258	24	4. Grassland	9.50%	Cold Grassland

Mauritania	Banc d'Arguin National Park	9.3, 10.4	11,907	7,014	9. Sea		58.91%	Sea Water
Mexico	Sian Ka'an	5.4	5,300	1,879	9. Sea		35.46%	Sea Water
	Whale Sanctuary of El Vizcaino	10.6	3,699	1,715	8. Desert		46.36%	Semi Desert Shrubs
Mongolia/ Russian Federation	Uvs Nuur Basin - Mongolian + Russian Federation Sections	5.14	12,577	3,660	5. Wetlands (inland)		29.10%	Inland Water
Nepal	Royal Chitwan National Park	1.4	1,145	452	11. Artificial - Terrestrial		39.50%	Fields and Woody Savanna
	Sagarmatha National Park	6	1,126	251	8. Desert		22.32%	Bare Desert
	New Zealand Sub-Antarctic Islands	1.4	13,867	13,093	9. Sea		94.42%	Sea Water
New Zealand	Te Wahipounamu-South West New Zealand	10.1	25,159	9,416	1.2. Forest (Temperate broadleaf and mixed)		37.42%	Evergreen Broadleaf Forests
	Tongariro National Park	5.12, 6	684	246	4. Grassland		36.00%	Low Sparse Grassland
	Air and Ténéré Natural Reserves	6, 8.1	78,567	71,373	8. Desert		90.84%	Bare Desert
Niger	'W National Park	1.5, 2.2	2,243	1,859	2. Savanna		82.86%	Savanna (Woods)
Oman	Arabian Oryx Sanctuary	8.1	26,833	24,499	8. Desert		91.30%	Bare Desert
Panama	Darién	1.6	5,582	1,776	1.3. Forest (Tropical moist)		31.81%	Tropical Rainforest
	Historic Sanctuary of Macchu Picchu	6	372	86	4. Grassland		23.20%	Upland Tundra
Peru	Huascarán National Park	6	3,288	1,764	3. Shrubland		53.64%	Shrub Deciduous
	Manu National Park	1.6	14,845	10,130	1.3. Forest (Tropical moist)		68.24%	Tropical Rainforest
	Rio Abiseo National Park	1.9	2,847	892	3. Shrubland		31.35%	Shrub Deciduous
Philippines	Puerto-Princesa Subterranean River National Park	5.18	54	21	11. Artificial - Terrestrial		39.31%	Evergreen Forest and Fields
	Tubbataha Reef Marine Park	9.4	297	297	9. Sea		100.00%	Sea Water
Portugal	Laurisilva of Madeira	1.4	128	34	1.2. Forest (Temperate broadleaf and mixed)		26.89%	Evergreen Broadleaf Forests
Romania	Danube Delta	5.4, 5.6	7,813	1,318	5. Wetlands (inland)		16.86%	Inland Water
	Central Sikhote-Alin	1.4	15,497	4,215	1.1. Forest (Temperate and boreal needleleaf)		27.20%	Conifer Boreal Forest
	Golden Mountains of Altai	4.4	17,029	2,905	1.1. Forest (Temperate and boreal needleleaf)		17.06%	Wooded Tundra
Russian Federation	Lake Baikal	1.1, 5.4, 9.1	82,263	32,978	5. Wetlands (inland)		40.09%	Inland Water
	Virgin Komi Forests	1.1	36,426	16,070	1.1. Forest (Temperate and boreal needleleaf)		44.12%	Conifer Boreal Forest
	Volcanoes of Kamchatka	6, 8.3	36,108	9,534	1.2. Forest (Temperate broadleaf and mixed)		26.40%	Small Leaf Mixed Woods
	Western Caucasus	1.4	3,595	1,079	11. Artificial - Terrestrial		30.02%	Cool Forest and Field
Senegal	Djoudj National Bird Sanctuary	5.4	140	33	5. Wetlands (inland)		23.89%	Inland Water
	Niokolo-Koba National Park	2.1	8,456	7,630	2. Savanna		90.23%	Woody Savanna

Seychelles	Aldabra Atoll	9.4	160	120	9. Sea	74.85%	Sea Water
	Vallée de Mai Nature Reserve	1.6	0	0	13. Missing data	99.47%	Missing Data
Slovenia	Skocjan Caves	7.2	4	4	11. Artificial - Terrestrial	93.74%	Crops and Town
Solomon Islands	East Rennell	9.4	833	709	9. Sea	85.20%	Sea Water
South Africa	Greater St Lucia Wetland Park	5.4	2,380	727	9. Sea	30.57%	Sea Water
	Okhahlamba-Drakensberg Park	4.4, 6.0	2,282	1,516	2. Savanna	66.41%	Savanna (Woods)
	Doñana National Park	5.4, 5.5	498	226	8. Desert	45.43%	Semi Desert Shrubs
Spain	Garaionay National Park	1.4	65	21	3. Shrubland	32.84%	Mediterranean Scrub
Sri Lanka	Ibiza, Biodiversity and Culture	9.3	154	142	9. Sea	92.19%	Sea Water
Suriname	Sinharaaja Forest Reserve	1.6	96	74	12. Artificial - Aquatic	76.79%	Rice Paddy and Field
Sweden	Central Suriname Nature Reserve	1.6	16,257	16,174	13. Forest (Tropical moist)	99.49%	Tropical Rainforest
	The High Coast	6	1,594	1,063	9. Sea	66.69%	Sea Water
	The Laponian Area	1.2	9,373	2,241	8. Desert	23.91%	Barren Tundra
	Jungfrau-Aletsch-Bietschhorn	8.3	538	322	8. Desert	59.88%	Glacier Ice
Switzerland	Monte San Giorgio	6	24	14	1.2. Forest (Temperate broadleaf and mixed)	56.69%	Small Leaf Mixed Woods
	Kilimanjaro National Park	6	671	201	8. Desert	29.94%	Semi Desert Shrubs
Tanzania, United Republic	Ngorongoro Conservation Area	1.5, 2.1	8331	2,370	4. Grassland	28.44%	Hot and Mild Grasses and Shrubs
	Serious Game Reserve	2.1	47,864	14,262	14. Forest (Tropical dry)	29.80%	Dry Tropical Woods
	Serengeti National Park	2.1	13,293	3,828	11. Artificial - Terrestrial	28.80%	Crops and Town
Thailand	Thung Yai - Huai Kha Kaeng Wildlife Sanctuaries	4.6	5,916	3,445	1.3. Forest (Tropical moist)	58.24%	Tropical Rainforest
Tunisia	Ichkeul National Park	5.5	118	56	8. Desert	47.72%	Bare Desert
	Göreme National Park and the Rock Sites of Cappadocia	6, 11.1, 11.3	163	112	4. Grassland	68.92%	Low Sparse Grassland
Turkey	Hierapolis-Pamukkale	5.1, 6	5	4	11. Artificial - Terrestrial	86.08%	Cool Crops and Towns
Uganda	Bwindi Impenetrable National Park	1.9	322	152	11. Artificial - Terrestrial	47.25%	Fields and Woody Savanna
	Rwenzori Mountains National Park	3.7, 8.3	651	104	2. Savanna	15.93%	Woody Savanna
	Dorset and East Devon Coast	6, 10.1	26	23	9. Sea	90.22%	Sea Water
United Kingdom	Giant's Causeway and Causeway Coast	6, 10.1	2	2	11. Artificial - Terrestrial	64.21%	Forest and Field
	Gough Island Wildlife Reserve	10.1	64	57	13. Missing data	89.05%	Missing Data
	Henderson Island	1.4	41	27	13. Missing data	65.15%	Missing Data
	St. Kilda	6	11	11	9. Sea	95.06%	Sea Water
USA	Carlsbad Caverns	7.1	186	117	3. Shrubland	62.73%	Dry Woody Scrub
	Everglades National Park	5.4	5,735	2,049	9. Sea	35.72%	Sea Water

	Grand Canyon National Park	6	7,813	4,991	8. Desert	63.88%	Semi Desert Shrubs
	Great Smoky Mountains National Park	1.4	1,975	1,374	1.2. Forest (Temperate broadleaf and mixed)	69.55%	Mixed Forest
	Hawaii Volcanoes National Park	6	717	716	13. Missing data	99.83%	Missing Data
	Mammoth Cave National Park	7.2	223	166	1.2. Forest (Temperate broadleaf and mixed)	74.26%	Deciduous Broadleaf Forest
	Olympic National Park	1.4	3,499	1,612	1.1. Forest (Temperate and boreal needleleaf)	46.08%	Cool Conifer Forest
	Redwood National Park	1.4	419	304	1.1. Forest (Temperate and boreal needleleaf)	72.66%	Cool Conifer Forest
	Yellowstone	1.4, 5.12	8,816	6,743	1.1. Forest (Temperate and boreal needleleaf)	76.48%	Cool Conifer Forest
	Yosemite National Park	6	3,053	1,664	1.1. Forest (Temperate and boreal needleleaf)	54.51%	Cool Conifer Forest
Venezuela	Canaima National Park	1.6, 5.1	30,456	10,962	1.3. Forest (Tropical moist)	35.99%	Tropical Rainforest
	Ha Long Bay	10.1	419	415	9. Sea	99.08%	Sea Water
Vietnam	Phong Nha - Ke Bang National Park	7.1	896	399	11. Artificial - Terrestrial	44.48%	Fields and Woody Savanna
Yugoslavia	Durmitor National Park	6	1,246	645	11. Artificial - Terrestrial	51.75%	Crops and Town
Zambia/ Zimbabwe	Victoria Falls/Mosi-oa-Tunya (Zambia + Zimbabwe sections)	5.1	66	20	2. Savanna	29.69%	Savanna (Woods)
Zimbabwe	Mana Pools National Park, Sapi and Chewore Safari Areas	5.5	6,781	3,471	11. Artificial - Terrestrial	51.19%	Crops and Town

* Olson/GLCC codes do not correspond exactly to IUCN/SSC level 2 habitat types. For forest only they could be allocated to one of four types: 1.1 Forest (Temperate and boreal needleleaf); 1.2 Forest (Temperate broadleaf and mixed); 1.3 Forest (Tropical moist); 1.4 Forest (Tropical dry).

Table A4.2: Second-Level IUCN/SSC Habitat Types present in World Heritage Sites

Habitat Level 1	Habitat Level 2	Africa	Asia	Oceania/Australasia	Europe	North America	South America	Global Total
1. Forest	1.1 Boreal Forest		6		5	8		19
	1.2 Subarctic		1		2	4		7
	1.3 Subantarctic						1	1
	1.4 Temperate	5	17	9	21	14	5	71
	1.5 Subtropical / Tropical Dry	22	7	9	1	4	9	52
	1.6 Subtropical / Tropical Moist	20	18	10		3	25	76
	1.7 Subtropical / Tropical Mangrove	3	6	5		3	10	27
	1.8 Subtropical / Tropical Swamp	10	8	4		2	8	32
	1.9 Subtropical / Tropical Moist Montane	9	8	2		1	10	30
	Total	69	71	39	29	39	68	315
2. Savanna	2.1 Dry	12	1	2			5	20
	2.2 Moist	10	4	1		1	7	23
	Total	22	5	3	0	1	12	43
3. Shrubland	3.1 Subarctic		1		1	3		5
	3.2 Subantarctic			1				1
	3.3 Boreal	1	6	2	5	8		22
	3.4 Temperate	5	8	6	11	4	2	36
	3.5 Subtropical / Tropical Dry	17	4	6	3	4	5	39
	3.6 Subtropical / Tropical Moist	6	2	5		1	9	23
	3.7 Subtropical / Tropical High Altitude	7	6	1	2	1		17
	3.8 Mediterranean-type Shrubby Vegetation	2		1	1	1		5
	Total	38	27	22	23	22	16	148
4 Grassland	4.1 Tundra	1	6			6	3	16
	4.2 Subarctic		2	2	2			6
	4.3 Subantarctic			2			1	3
	4.4 Temperate	6	13	6	15	10	3	53
	4.5 Subtropical / Tropical Dry	12	9	4		2	1	28
	4.6 Subtropical / Tropical Seasonally Wet / Flooded	6	8	4		2	6	26
	4.7 Subtropical / Tropical High Altitude	8	5		1		6	20
5. Wetlands (inland)	Total	33	43	18	18	20	20	152
	5.1 Permanent Rivers / Streams / Creeks	27	30	7	15	15	26	120
	5.2 Seasonal / Intermittent / Irregular Rivers / Streams / Creeks	11	3	3		2	2	21
	5.3 Shrub Dominated Wetlands	1	1		3	1	1	7
	5.4 Bog, Marshes, Swamps, Fens, Peatlands	21	9	9	9	10	11	69
	5.5 Permanent Freshwater Lakes	7	12	6	10	8	9	52
	5.6 Seasonal / Intermittent Freshwater Lakes	1	2		2	2		7

	5.7 Permanent Freshwater Marshes / Pools	11	16	6	11	7	4	55
	5.8 Seasonal / Intermittent Freshwater Marshes / Pools	4			1		1	6
	5.9 Freshwater Springs and Oases	12	8	6	11	4	9	50
	5.10 Tundra Wetlands		1			2	1	4
	5.11 Alpine Wetlands	2	5	1	4	2	3	17
	5.12 Geothermal Wetlands	1	8	1	1	2	2	15
	5.13 Permanent Inland Deltas	1	4		2	1		8
	5.14 Permanent Saline, Brackish or Alkaline Lakes	1	1				1	3
	5.15 Seasonal/Intermittent Saline, Brackish or Alkaline Lakes and Flats	3						3
	5.16 Permanent Saline, Brackish, or Alkaline Marshes/Pools		1			1		2
	5.17 Seasonal/Intermittent Saline, Brackish or Alkaline Marshes/Pools	2			1	2	1	6
	5.18 Karst and Other Subterranean Hydrological Systems	2	4		6	3	3	18
	Total	107	105	39	76	62	74	463
6. Rocky Barren Areas	6 Rocky Barren Areas	20	25	16	18	16	18	113
	Total	20	25	16	18	16	18	113
7. Cave and Subterranean	7.1 Caves		2	1	2	1	1	7
	7.2 Subterranean Habitats	1	7	3	7	1	1	20
	Total	1	9	4	9	2	2	27
8. Desert	8.1 Hot Desert	5	2	4	1	3		15
	8.2 Temperate Desert		2	3	1	3	1	10
	8.3 Cold Desert	4	9	3	4	6	2	28
	Total	9	13	10	6	12	3	53
9. Sea	9.1 Open Sea	4	4	4	1		4	17
	9.2 Shallow	3	4	2	1	4	4	18
	9.3 Seagrass Beds	4	4	5	6	1	3	23
	9.4 Coral Reefs	2	3	6	2	2	7	22
	9.5 Kelp / Macroalgae							0
	Total	13	15	17	10	7	18	80
10. Coastline/Intertidal	10.1 Rocky Shores	3	4	9	8	6	10	40
	10.2 Sand, Shingle or Pebble Shores	3	6	8	4	6	9	36
	10.3 Estuarine Waters	1	4	1	2	4	5	17
	10.4 Intertidal Mud, Sand or Salt Flats	1	3	2		2	1	9
	10.5 Intertidal Marshes	2	1	2		2		7
	10.6 Coastal Brackish / Saline Lagoons	1	1	3	2	4	6	17
	10.7 Coastal Freshwater Lagoons	1			1		1	3
	10.8 Karst & Subterranean Hydrological Systems						2	2
	Total	12	19	25	17	24	34	131
11. Artificial - Terrestrial	11.1 Arable Land	6	14	1	5		9	35
	11.2 Pastureland	11	10	2	10	1	12	46

	11.3 Plantations	2	4		5	1	2	14
	11.4 Rural Gardens	10	8	5	8	4	12	47
	11.5 Urban Areas	2	5	1	6	4	3	21
	11.6 Subtropical / Tropical Heavily Degraded Former Forest		1				1	2
	Total	31	42	9	34	10	39	165
12. Artificial - Aquatic	12.1 Water Storage Areas							0
	12.2 Ponds							0
	12.3 Aquaculture Ponds				1			1
	12.4 Salt Exploitation Sites			1	1			2
	12.5 Excavations	1						1
	12.6 Wastewater Treatment Areas		1					1
	12.7 Irrigated Land							0
	12.8 Seasonally Flooded Agricultural Land		1					1
	12.9 Canals and Drainage Channels, Ditches		1		2			3
	12.10 Karst & Subterranean Hydrological Systems							0
	Total	1	3	1	4	0	0	9
13. Introduced Vegetation	13 Introduced Vegetation	3	2	6	2	4	4	21
	Total	3	2	6	2	4	4	21
14. Other	14 Other							0
	Total	0	0	0	0	0	0	0
15. Unknown	15 Unknown							0
	Total	0	0	0	0	0	0	0
Grand Total		359	379	209	246	219	308	1,720

